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APRIL 1989

# DECdirect

## Software

from the world's  
No. 1 in networking



The Best of  
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Operating Systems

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Projects Tools

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Network and  
Communications

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Information  
Management

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Manufacturing and  
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End User Computing

digital

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# Foreword

Digital has just begun shipping new versions of VAX/VMS and ULTRIX Worksystem Software, that both include the DECwindowsh desktop environment for workstations. A Personal Computer implementation will follow later this year.

These products are but a tip of an iceberg that will become apparent in subsequent editions of DECdirect Software. Stay tuned!

With the new release of VAX/VMS, V5.1 users now have a bundled Rdb runtime licence. This allows you to implement and distribute applications built with Digital's high-performance relational database, Rdb, at minimum cost. Rdb includes an SQL interface.

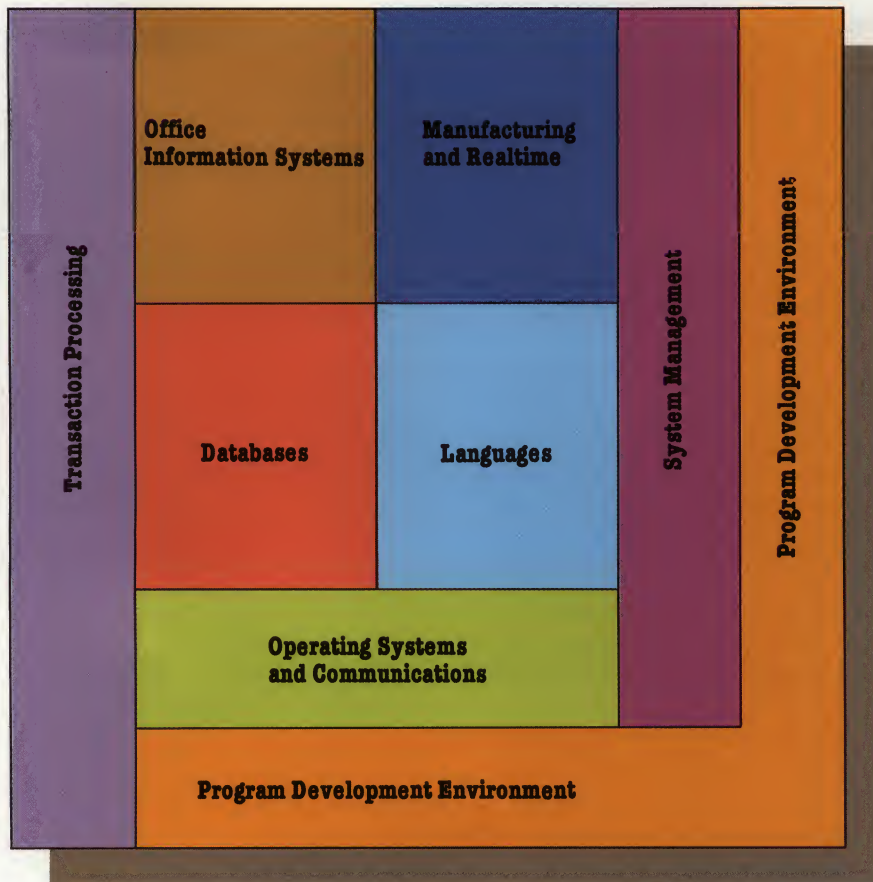
There's never been a better time to look at Rdb. (Described on page 76 of this catalogue - why not take a look?)

Rdb plus many supporting products, including ACMS, VAX Data Distributor, TEAMDATA, Datatrieve, VAXlink, VIDA and supported languages are available from DECdirect. All appear in this catalogue.

We are always trying to improve our service to you, our customer. Based on surveys the results of your feedback have been incorporated in our Catalogue.

Thank you for using DECdirect Software so extensively. And if you have any current software needs or require advice, call us today. As always, we'll be delighted to help.

# Introduction



## Digital's Software – a competitive edge you can build on

Digital spends over half of its worldwide Engineering Budget on the development of quality software products. Much of what you see in this catalogue are tools and subsystems that can either be built into your own application code, or used to speed the development process.

## Speeding Software Development

The components of the VAXset package have been used for many years to implement and maintain applications developed within Digital. The result has been significant leaps in both quantity and quality of code developed per engineer, with almost total eradication of operational defects before release.

## Connecting Computers, Users and Information

Many Digital products help users to connect computers and their applications together, without geographic limitations. These allow people, independent of their native host environments, to share electronic mail, information and hardware resources.

Digital's Relational and CODASYL databases can reside anywhere on a DECnet wide area network, and be used as if each were local. Products such as VIDA and VAXlink extend these same capabilities to databases on IBM mainframe hosts, with application or transaction processing code on the VAX side of the link. VIDA in particular makes IDMS/R databases or VSAM files on the mainframe accessible as if they were local relational databases to both users and application software.

## Taking it for granted

The goal was simplicity. To be able to run the same binary images on any VAX, however large or small. For programmers to be able to use your investment in existing, debugged code, independent of the language mix used. To use a common file system and single, productive, development environment.

These are the goals that others aspire to and promise for the long term future; Digital has been delivering these capabilities for over ten years!

VAX users have enjoyed an unparalleled ability to write software once, and to deploy (and redeploy) the results on whichever size of machine fits the business need. No rebuild. No conversions. Just the flexibility to respond to opportunities with stealth and minimum cost.



### Transaction Processing

Digital has a variety of products and services to help design and implement transaction processing systems. This builds on the excellent performance obtainable with Digital's two transaction processing monitors – ACMS and DECintact. Both TP monitors can make extensive use of Digital's networking products where this is desirable, to provide true distributed TP applications.

### Office number one

Digital is the number one supplier of Integrated Office Systems worldwide. Products such as ALL-IN-1 integrate standard office functions, such as Electronic Mail, Word Processing, Videotex and Computer Conferencing, with an organisation's own applications.

Extra Message Router Gateways, such as those for SNADS, PROFS, UNIX and X.400 allow mail to be exchanged with users of other mail systems, conscious only of their own local environment.

Electronic Document Exchange products, including EDE with IBM DISOSS and EDE-WANG (for WANG word processors) also allow the (bidirectional) sharing of your existing investment in documents.

### Where from here?

Many Digital customers employ computers from a variety of computer manufacturers. To date, we have provided products that build on such investments made within an organisation. For example, we have products that integrate Personal Computers (DECnet-DOS, PCSA), UNIX workstations (ULTRIX Mail Connection, VMS/ULTRIX Connection, DECnet-ULTRIX) and IBM Mainframes (by means of many IBM interconnect products), into a Digital DECnet/OSI network.

One of Digital's goals is to deliver true vendor independent communications products. Our effort so far has resulted in the release of international compliant products such as OSAK, FTAM (for File Transfer) and Message Router X.400 Gateway (for mail and message exchange). Digital have also started to deliver Electronic Data Interchange Products, designed to be able to interact with several Value Added Networks.

The effect of such developments is to begin to use all computers as part of a world-wide, integrated computer network, much in the same way that telephone systems operate today.

It is likely that you will have the ability to order goods and services directly from your machine within the next five years. We intend to give you all the right business connections!

### Revolution in the making

Digital is beginning to ship versions of products that comply with CDA(tm) – a compound document architecture, based on international standards such as SGML, ODA/ODIF and Adobe's PostScript(tm) Page Description Language. CDA allows the integration of text, graphics and images in a single document.

What's new? CDA, and its underlying document format, DDIF, are available on multiple operating system platforms, starting with VMS and ULTRIX.

The added value is that documents are not static, but can maintain 'live links' to CDA compliant applications. This allows the data in databases and information in other documents to affect changes on demand, without user intervention. Such changes can include financial summaries, and graphics built from database enquiries.

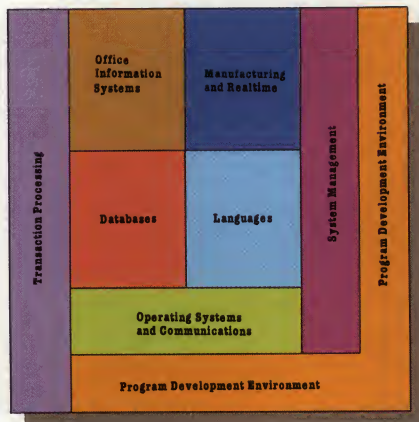
DECwrite, DECdecision and the VAXimage products are Digital's first applications that employ CDA.

CDA has been publicly endorsed by Apple, Applix, Aldus, Ashton-Tate, Interleaf, Datalogics, Information Dimensions, Kodak, Keyword, Molecular Design Ltd, Odesta, Polygen, Execucom and Microsystems Engineering Corp (MEC), with many more to follow. There are also converters available to move information from a variety of key document and graphics formats which do not comply with CDA.

The eventual goal is that information, in whatever form, can be passed intelligently between users without knowledge of their hardware or operating environment of choice. VAXstation users will be able to modify Apple MAC sourced documents. A MAC user can enhance graphics from a DDIF file mailed to them. And users will have the ability to mix and match information from many different platforms into a single, live (or final form) document.

What you see is only the start...

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# The Office



## The Office

### 20/20 VAX

An integrated planning tool running under VAX/VMS and ULTRIX-32 operating systems, with spreadsheet, business graphics, data management and project management functions.

### ALL-IN-1

An integrated office information system with the basic functions of word processing, electronic mail and office facilities (electronic filing, appointments calendar, notepad, calculator, telephone and address management). Can be extended by adding additional integrated applications for the user.

### ALL-IN-1 STARTER SYSTEM

Pre-configured office information system as a subset of ALL-IN-1 with the functions of word processing, electronic mail and electronic filing. ALL-IN-1 STARTER SYSTEM can be extended into the complete ALL-IN-1 system.

### MAILbus Products

A variety of store-and-forward message routing systems that can be integrated together. Users may send and receive electronic mail between VAXmail, ALL-IN-1, X.400, UNIX, ULTRIX, PROFS, CMS and DISOSS mail facilities, conscious only of their native environment.

### VAX VTX

Software for distributing information anywhere in an enterprise-wide computer network. Up-to-date, structured and categorised business information which is prepared and maintained centrally but available to any number of participants.

### VAX Notes

A computer-assisted conferencing and information system for co-workers, wherever they may be located.

### WPS-PLUS

Digital's 'Gold Key' Word Processing product, including spell checker, that runs on a variety of Digital VAX and Personal Computer platforms.

### EDE/IBM DISOSS

External document interchange with IBM-DISOSS. Users of the ALL-IN-1 office information system can process, search, send and delete text stored in an IBM DISOSS/370 documentation database. In addition, ALL-IN-1 users can access documents held on an IBM-DISOSS/370 host.

### VAX DECpage

An add-on to the WPS-PLUS word processing system and ALL-IN-1 for integrating graphics in text and producing high-quality printed documents.

### VAX DOCUMENT

Electronic Publishing System which allows VMS users to produce high-quality, technical documentation. Graphics in sixel format can be integrated into the text.

### DECwrite

DECwindows and CDA (Compound Document Architecture) compliant document processing tool with integrated drawing facilities, spell checker and thesaurus. Users can choose WPS-PLUS, EMACS, EDT or EVE editing keys. DECwrite integrates text and graphics, and has the ability to maintain live links to other applications.

### DECdecision

DECwindows compliant end user database tool with integrated business graphics, sophisticated spreadsheet and BUILDER command language. Information can be sourced from Rdb/VMS, RMS and DBMS (via Datatrieve), and IBM DB2 and Cullinet IDMS/R databases (via VAX VIDA). Tables and graphics may be integrated via live links into DECwrite documents.

### VAX DECcalc

Basic Spreadsheet program for VAX/VMS users, including online help and a number of mathematical, financial and technical functions.

### VAX DECcalc-Plus

A technical/scientific spreadsheet, which may be extended by adding user-written functions in any VAX compiled language. Extensive mathematical, financial, statistical and technical functions. Considerably enhanced variant of VAX DECcalc.

### VAX DECgraph

Presentation graphics for the preparation of company data.

### VAX Xway

Interactive, programmable conversion of the storage formats used by different spreadsheet programs.



# The Office

## **Our unique combination of information architectures and standards**

Computer applications in the office are becoming more and more important. New technologies available mean new opportunities for applications.

An office information system does not consist of a single product, or even of a series of individual products. It is more of a package of capabilities with which many different information technologies such as management information systems, network systems and existing office technologies can be brought together in a single, integrated system.

When you are planning an office information system, it has to be suited to your company. This requires systems which offer precisely those individual solutions that you need and which can be combined into a tailor-made total system.

Digital Equipment has developed a unique combination of different information architectures and standards. The ALL-IN-1 office information system is the result. The advantage: all ALL-IN-1 users can communicate with each other and with users of other computer systems. However, each has their own individual system – the secretary, who needs many administrative and word processing functions, the manager, who needs a rapid flow of information and technical personnel, who make heavier development demands on the system.

The architecture of the whole system provides each user with a tailored menu system, which grows along with the tasks which have to be undertaken. The user interface remains the same as this process takes place.

## **Invest step by step in the right concept...**

It is immaterial whether you purchase a workstation computer with a few applications programs or a fully expanded VAX system from Digital – you always get access to an office information system. Hardware and software are designed so that they are a component of the system architecture in the office.

You can start small with one or two workstations for one group, for special tasks such as word processing or spreadsheet calculation. Later, if you need more computer support, or additional functionality, your system can be expanded or modified.

## **... or go for a total solution right away**

Software services, including onsite consultancy, ensures a rapid and successful introduction of Digital's Office Products into your organisation. Please contact your local Digital office for details of the ways in which we can help.



# 20/20 VAX

## Spreadsheet with Graphics



20/20 VAX is a software product developed by Access Technology Incorporated. In addition to normal spreadsheet and graphics functions, the program includes database and project management functions.

20/20 VAX is suitable for both commercial and technical/scientific personnel. Because it is simple to use, 20/20 is also suitable for users who have little experience with computer systems. 20/20 VAX is highly recommended for performing "What if ...?" analyses; the results and changes which occur can be seen in multiple windows, including graphics.

The spreadsheet supports tables of 1000 columns and 1000 rows. Formulae, numeric data and text can be entered in the individual cells of the spreadsheet. Cells can be selected simply with the cursor control keys or by means of special commands. If necessary, the user can refer to the system's extensive help facility.

After selecting menu functions, explanatory text appears for the command which has just been issued.

### Features:

- Screen-based, menu-controlled system.
- Display of spreadsheet and graphics on the screen in up to four windows.
- Simultaneous consolidation of several worksheets.
- Graphics: pie charts, line graphs, bar charts and histograms.
- Generation of commonly used command sequences

By rank and file...



#### **Various facilities for selecting functions:**

Entering the function from the keyboard, cursor key selection or entering the respective initial letters of a function. In comparison with other standard spreadsheet programs, 20/20 VAX has substantially greater functionality. For fast comparison of tables and graphics there are up to four windows which can be on the screen simultaneously. Furthermore, there is the capability to consolidate across several spreadsheets.

For graphic presentations, the graphics program integrated into 20/20 VAX offers pie charts, line graphs, bar charts and histograms. Up to four presentations per screen are possible. When models are recalculated, the graphics displayed on-screen are redrawn automatically. Titles can be freely allocated to the individual graphic presentations.

#### **Further functions**

Database functions such as search and sort, technical financial functions such as final value calculation, project management with critical path analysis as well as the generation of command procedures and calling of VMS commands from within the 20/20 VAX software package.

#### **20/20 VAX**

#### **Unique product identifier VFD**

<b>Complementary software products:</b>	Office information system ALL-IN-1
<b>Disk storage capacity (in MB):</b>	Installation 1.5, Operation 0.7
<b>Complementary information:</b>	SPD 29.94

Digital offers an on-site implementation and start-up service for this product. The service ensures maximum productivity in the minimum of time, increases competence and generates confidence.

# ALL-IN-1

## Office Information System



### Features

- An office information system and software tool integrated in a single software package.
- Word processing, electronic mail, electronic filing, calendar, lists and desk-top calculator.
- Menu-driven software package for typical office applications which is flexible to use. Ideal for setting up and integrating additional company-specific applications.
- Capabilities including Videotex and Computer Conferencing may be added, ensuring information is available to its target audience in a timely and accurate manner

ALL-IN-1 offers the benefit of a uniform user interface to the various applications within the company.

Different language versions of the ALL-IN-1 system can be installed and run in parallel on one computer system simultaneously.

### Professional word processing

With its powerful processing, calculating, character and printing functions, WPS-PLUS is the right word processing system for the most varied documentation and correspondence tasks in commercial, technical and scientific applications.

The technical character set contains all the Greek characters plus a wide range of technical symbols for scientific and technical applications. The 2D editor produces diagrams, line drawings, complex equations and matrices which can be inserted at any point inside text.

### Electronic mail

Electronic mail is the means of communication between employees in the different departments who use ALL-IN-1 or ALL-IN-1 STARTER SYSTEM. Fast, selective distribution of information accelerates the flow of information within the company and increases overall productivity as a result.

The user merely has to specify the recipient of a message and the system transmits the information within a very short time. Recipients of copies of the message can also be specified when messages are addressed. The electronic mail facility allows the use of short forms of names and distribution lists. The user can request brief confirmation of reception or reading of a message. The messages sent are presented in the form of documents and are processed accordingly. Separate folders are available for incoming messages, messages which have been read, those which have been written and those which have been sent.

There is the facility of message exchange with ALL-IN-1 or ALL-IN-1 STARTER SYSTEM users on other computer systems within the DECnet network. Exchange is also possible with other office information systems from a variety of other computer manufacturers.

This opens up communications facilities for users across the whole company.

From well-informed circles



### Time Management

With the Time Management module of the ALL-IN-1 system users manage their own personal appointments diary.

Using the automatic Time Management facility, dates and times of important meetings can be centrally arranged, changed or cancelled for a group of people. Electronic mail is used for fast invitation transmission and confirmation of attendance.

Special functions also permit marking of specified periods within which the user is not available for meetings or travelling. Diary entries can also be flagged as confidential, so other users will not be able to access related information.

### Communication

With the communication subsystem, the user can set up a link with other computer systems. By using communication control files – ALL-IN-1 documents with special commands – complete job processes can then be performed automatically on these computer systems.

### Desk calculator

The user can perform calculations with the desk calculator application; the results of calculations can be integrated in documents. The numeric keypad on the terminal keyboard become the buttons for the desk calculator.

### Filing

Various system services are available for file management. For example, several documents can be printed or deleted at once. The criteria for selection of documents are entered in the system by the user. Depending on requirements, documents can be filed individually in one or more folders. Titles or keywords for the documents can be modified rapidly at any time.

### Help information

While working with ALL-IN-1, the user can press a key to obtain explanatory information on-screen. The user will receive detailed information about the functions available for use.

### ALL-IN-1 as a development tool

ALL-IN-1 is a complete development tool which offers the user the functional performance of 4th generation development systems.

Programmers may create prototypes and develop individual applications which can then be integrated into the overall ALL-IN-1 system.

The result is an optimal match between independent applications and the standard ALL-IN-1 applications.

With the advantage that the user communicates with the system via a consistent user interface and range of facilities.

### Fitting in

ALL-IN-1 is designed to fit your office needs both today and as your company evolves.

Digital offers a wide range of related planning and consultancy services to configure ALL-IN-1 to your requirements. For further details, please contact your local Digital office.

### ALL-IN-1

Unique product identifier AAA

#### Complementary software products:

Document preparation:	DECpage and VAX document
Connection to other office systems:	EDE/IBM DISSOS

Disk storage capacity (in MB):	Installation	Operation
	16.0	16.0

The size of the disk storage required depends on the number of users and the volume of text and mail.

Complementary information:	SPD 27.30
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# ALL-IN-1 STARTER SYSTEM

## Document Processing and Mail



### Features

- Low-cost entry-level system for office communication.
- Integrated software package for word processing, electronic mail, electronic filing with fixed menus.
- Designed as a subset of ALL-IN-1. Can be expanded into a complete ALL-IN-1 system.
- Suitable for use at team and department level.
- Integration in a company-wide network for office communications using Digital MAILbus Products

**Test the water!**

ALL-IN-1 STARTER SYSTEM offers low-cost entry into the world of office communication. Designed as a subset of ALL-IN-1, ALL-IN-1 STARTER SYSTEM can be expanded at any time into the full product. Both allow the construction of a company-wide office communications network based on the VAX family of computers. In view of the compatibility which exists between individual Digital products, a start can be made on office communications at team or department level. The system can be adapted simply to subsequent needs.

ALL-IN-1 STARTER SYSTEM offers the user integrated functions for word processing, electronic mail and electronic filing. ALL-IN-1 STARTER SYSTEM can be integrated into heterogeneous hardware environments via gateways and connected via Digital MAILbus products to many other office information systems.

ALL-IN-1 STARTER SYSTEM offers users all functions for modern word processing in a single system. With its efficient processing, calculating, character and print functions ALL-IN-1 STARTER SYSTEM is ideal for varying documentation and correspondence tasks in commercial, technical and scientific application areas.

### Filing

With ALL-IN-1 STARTER SYSTEM each user has their own personal "filing cabinet" with "folders" and "documents". This means that each user can arrange filing according to personal preferences.



### Professional word processing

System functions including a variable line ruler, bold print, underlining and double underlining, automatic word wrap and page breaks, plus automatic formatting and centering, offer the user extensive layout facilities. Other functions include headers and footers, page searching, and search and replace in the entire text. Blocks of text can be stored temporarily and subscript and superscript characters are possible. More sophisticated functions include assisted hyphenation, calculation functions, lists of abbreviations and text modules, footnotes, multicolumn printing, automatic paragraph numbering and generation of lists of contents.

These functions are complemented by strikethrough, tabs (including decimal tabs) and marginal marks. The line width for documents is a maximum of 256 characters. All word processing commands appear on the screen immediately after they are entered.

### Technical character set and 2D editor

The technical character set contains all the Greek characters plus a wide range of technical symbols for scientific and technical applications. The 2D editor produces diagrams, line drawings, complex equations and tables.

### Electronic mail

Electronic mail is the modern means of communication between employees working in different departments. Rapid distribution accelerates the flow of information within the company and increases overall productivity.

With ALL-IN-1 STARTER SYSTEM, the user merely has to specify the recipients of a message and the system transmits the information to the desired point within a very short time. The electronic mail facility of ALL-IN-1 STARTER SYSTEM uses short forms of names and distribution lists. The user can request confirmation of reception and reading of the message.

The messages sent are presented to the user in the form of documents and are processed accordingly. Separate folders are kept for incoming messages, messages which have been read, those which have been written and those which have been sent.

Messages can be exchanged with ALL-IN-1 STARTER SYSTEM users on other computer systems within the DECnet network. This opens up the possibility of a company-wide network for users.

### Filing

Documents are stored in the user File Cabinet. They are assembled into folders, which have been set up as required by the user. A uniform user interface makes it possible to file and process documents in different formats. Employees can retain their existing working methods but benefit from extensive simplification.

For file maintenance, there are a number of different service functions for making copies, setting up folders and allocating keywords.

### Help information

While working with ALL-IN-1 STARTER SYSTEM, the user can call up explanatory help information on-screen by pressing a key.

### Growing with your needs

ALL-IN-1 STARTER can be upgraded to full, tailorable ALL-IN-1 integrated office system. Please contact your local Digital office for details of the planning and consultancy services available.

#### ALL-IN-1 STARTER SYSTEM

#### Unique product identifier VNN

#### Complementary software products;

ALL-IN-1 (ALL-IN-1 STARTER SYSTEM can be upgraded to the complete ALL-IN-1 system).

#### Disk storage capacity (in MB):

Installation 11.0, Operation 16.0

The size of the disk storage required depends on the number of users and the volume of text and mail.



# MAILbus Products

## Access to the World



Enterprise-wide electronic mail services have become the backbone of organisational communication and, in the long run, profitability.

However, to be a truly effective part of the way you do business, your electronic mail systems must allow all members of your enterprise on all systems to participate in a common community of mail users. Some suppliers have developed mail systems with different levels of service – often not communicating with others, even when developed by the same vendor.

Digital can help make it easy. Digital has a range of products that interconnect different mail systems – via a 'MAILbus' – to allow all users within an enterprise to exchange mail independent of their system of choice. In line with the X.400 international standard, we have been able to extend this capability to provide inter-enterprise electronic mail.

The MAILbus products are designed as add-on software products to the VAX Message Router Software, which is the core store and forward mail handler. The components include:

### Features:

- Store and Forward Mail Message Routers
- Can mix and match to provide transfers between different electronic mail systems seamlessly
- Options include ALL-IN-1, VMSmail, X.400, PROFS (and CMS), TELEX, SNADS (DISOSS) and several UNIX compatible transfer agents
- Users aware only of their native environment
- Easy customisation through an optional Message Router Programming kit

### VMS Mail

Every implementation of DECnet comes with a basic electronic mail facility called simply 'MAIL'. The product as provided does not provide store and forward capabilities, but assumes the destination user is available at the time of sending.

The system manager can purchase the optional Message Router VMSmail gateway product to provide a store-and-forward capability for this basic electronic mail facility. It may then also participate with the other MAILbus products.

### ALL-IN-1 Mail

ALL-IN-1 comes with the Message Router and an electronic mail subsystem bundled. You may add the other Message Router Products to this software to extend the mailing capabilities to other mail environments.

**The right connections**



### **X.400 Inter-Enterprise Mail**

The Message Router X.400 Gateway lets you connect private and public mail systems that support standards approved by the International Telegraph and Telephone Consultative Committee (CCITT), with your Digital systems. The Message Router X.400 software uses the Gateway Directory Services present to validate and address recipients of incoming mail, and to authenticate senders of outgoing mail.

### **IBM PROFS Office Systems**

Message Router/P Gateway allows the transparent exchange of electronic mail, messages, and revisable and final form documents between users in a DECnet environment and those in an IBM PROFS or IBM CMS in an SNA environment. Message Router/P need only be installed on one VAX in the DECnet Wide Area Network, where it serves all Digital systems that send or receive documents from the PROFS or CMS environments.

MR/P uses a DECnet/SNA Gateway to facilitate the link between the Digital and IBM environments.

### **IBM SNADS based Office Systems**

Message Router/S Gateway allows the transparent exchange of electronic mail, messages, revisable and final form documents, and MS-DOS files, between the users of Digital and IBM Office Systems. IBM System 36, 38 and the IBM 5520 also support SNADS, though the connection between SNA and DECnet networks must be through the IBM mainframe.

Text from Digital Office Systems, in WPS-PLUS, ASCII and Digital Document Exchange (DX) formats, are converted to DCA revisable format for transmission to SNADS systems. MS-DOS files are transferred with no conversion in either direction.

Digital and IBM users can feature in the same distribution list or message address, and delivery confirmation and non-delivery notification messages are supported.

### **Message Router/TELEX**

Message Router/Telex allows the other Digital MAILbus products to capitalise on the vast installed base of Telex machines present worldwide. Both outgoing, and suitably tagged incoming messages can be handled.

The interface to the telex network is via a third party telex box that is available subject to local PTT regulations.

### **ULTRIX Mail Connection**

ULTRIX Mail Connection allows users of Digital ULTRIX and connected UNIX systems to exchange electronic mail with both Digital systems and beyond. Using standard MAILbus products, the UNIX user is able to communicate with X.400, SMTP and IBM Office Systems via a suitably equipped DECnet network.

ULTRIX Mail Connection comprises an enhanced mail transfer agent based on the accepted UNIX "sendmail" transfer agent, and an enhanced mail user agent based on the industry-standard Rand Message Handler.

The ULTRIX Mail Connection product can also be used in conjunction with the graphically based ULTRIX Worksystem Software mail utility for workstation users.

### **Bottom Line Benefits**

MAILbus products help put your enterprise ahead of your competition by giving you the freedom to communicate quickly and effectively, whatever system you use. The Digital MAILbus products capitalise on your investment in systems—and people.

### **MAILbus Products**

Message Router	SPD: 26.33	Unique Product Identifier 732 (Base) 730 (VMSmail) 733 (Prog)
MR/P (PROFS)	SPD: 28.94	Unique Product Identifier VCG
MR/S (SNADS)	SPD: 29.24	Unique Product Identifier VDU
MR/X (X.400)	SPD: 27.50	Unique Product Identifier VDM
MR/T (Telex)	SPD: 29.96	Unique Product Identifier VAV
ULTRIX Mail Connection	SPD: 29.05	Unique Product Identifier VFG

### **Complementary Software Products**

ALL-IN-1 Integrated Office System  
Various IBM Office Systems  
Non-Digital implementations of UNIX  
DECnet/SNA Gateway Products



# VAX VTX

## Videotex Software



**Keeping up-to-date**

### Features:

- Simple access to information via a menu or keywords, from standard terminals.
- Reduced costs, elimination of customary storage, printing and distribution.
- Information is up-to-date and consistent.
- Design, set-up and maintenance of an information data-base – even by inexperienced users – is made simple using the bundled Information Provider software tool
- Entry and distribution of information from any point on the network and to all other network nodes.
- Access to applications such as electronic mail, transaction processing, text and database management systems, as well as most customer applications – via the VAX VALU applications interface.

- Incorporation of external applications via DECnet, DECnet/SNA LU6.2 or X.25 packet switch and data networks
- Includes support for IBM 3270 data stream terminals.

The success of a company depends on having the right information available at the right time in the right place. Open communication, i. e. an integrated, universal flow of information, has become a decisive factor in terms of productivity.

Digital Equipment Information Systems have been developed to exchange information within a company or a department along any number of routes and between any number of employees whether by electronic mail, videotex or computer conferencing.

With VAX VTX, Digital's videotex software, all important items of information can be distributed from a terminal or personal computer to any number of colleagues – in different formats, but always up-to-date and at low cost. The costs associated with normal information processing procedures for storage, printing and distribution are eliminated. From now on, information becomes available at the moment it is needed – at any point on the network.

### Keeping up-to-date is a competitive advantage

Keeping printed information up-to-date is very difficult and time-consuming. It has to be assembled, recorded, typed or set, printed and then distributed, evaluated and filed. It is not uncommon for information be already out-of-date after this long process.



The alternative: "softcopy" information with VAX VTX. This concept means that the entire stream of information, from the writing stage through distribution to filing takes place electronically. A number of cost factors involved in customary information distribution, such as printing, storage, distribution or destruction of documents are eliminated. Extensive documentation can be updated easily and immediately in the future, without having to reprint everything each time there is a minor change. At any time, and at any point on the information network, only the latest information is circulating.

VAX VTX offers the flexibility of a distributed computer architecture. All employees use central computing capacity, in order to remove the burden of general storage, maintenance and routine tasks from their system. At any point on a network, information can be entered or queried—within the department, from department to department, or to external agencies and other networks. The information is consistently up-to-date and accessible, regardless of the location of the information on the network.

VAX VTX is already being used successfully by many large companies for the maintenance of documents which are often several thousand pages long and which contain graphics as well as text. From company regulations, planning documents and directories, through product specifications, price lists, spares lists and reference material, to detailed descriptions of procedures.

#### Trouble-free access

With VAX VTX, new information can be entered into storage in the central information database from any network node. Any individual employee can therefore access a range of information which was previously inconceivable.

VAX VTX offers all this information in "prepared", i. e. structured and categorised form. The hitherto

customary sorting, leafing through documents and searching of piles of paperwork now belongs to the past.

Access to sensitive information can be restricted as desired, and the information source will remain secret, thanks to the distributed system architecture.

#### User-friendly menus and keywords

Working with VAX VTX is very simple. Foolproof menus guide the user to the required information step by step. By using keywords, it is possible to search for quite specific information. If VAX VTX finds more than one page in the information database under the search word, a help menu is provided automatically, giving a detailed breakdown of the information which is being sought.

The Information Provider and VALU integrated software packages allow VAX VTX to assemble individual items of information into information packages.

The Infobase Structure Tool is a graphics-based, menu-driven user

interface which considerably simplifies entering documents into the information database. Even non-technical users can design, set up, provide information for and maintain such databases. This means that the task of constantly updating and forwarding information can be split between several employees, relieving the load on central information management systems.

Information databases can be constructed at the locations where the information is obtained. Knowledge of file management and programming at command level are no longer a prerequisite. Corrections are made with the aid of screen forms, and no longer by adapting lines of code.

With the help of the optional VAX VALU applications interface, a bidirectional information system can be set up. Each individual employee can call up, distribute and process information and send the results back to the originator. Above all, however, VAX VALU offers opportunities of flexible networking with other computer systems.

#### VAX VTX

#### Unique Product Identifier 031

##### Complementary software products:

Communication Applications interface	DECnet-VAX VAX VALU
--------------------------------------	------------------------

<b>Disk storage capacity (in MB):</b>	<b>Installation</b>	<b>Operation</b>
	10.2	6.7

##### Complementary software products:

Communication DECnet-VAX (SPD 25.03), Application interface VAX VALU (SPD 26.94)

##### Complementary information in SPD 26.57.

In the October 1988 edition of the DECdirect Software Catalogue we announced a VAX/VTX subsystem called "VISTA" (VTX Infobase Structure Tool and Assister). It has been brought to our notice that "VISTA" is a trade mark of Vista Computer Systems Limited, one of our leading UK Complementary Solutions Organisations. Vista Computer Systems Limited produce and market a range of 4GL and related software tools under the VISTA name. They also use these products to build Turnkey Computer Solutions, based exclusively on Digital products, for publishing, printing, accounting and distributing applications.

In order to avoid confusion with the products of Vista Computer Systems Limited we are taking steps to cease using the name "Vista". For Further information on any of the products or related services of Vista Computer Systems Limited contact Vista Computer Systems Limited direct on 01494 3344 or write to them at 35 Soho Square, London W1V 5 DG.



# VAX Notes

## Electronic Conferencing



### Features:

- Simple structure for computer-assisted conferences, discussion topics and replies
- Use of VAX systems of all sizes – for small user groups and for hundreds of users in the worldwide network.
- Worldwide distribution of contributions to the conference within the network.
- Simple to use.
- Editing with familiar, standard text editors.
- Personal notebook relating to current conferences and topics.
- Special entries on topics and replies in the personal notebook.

Always in touch

VAX Notes makes it possible to carry out conferences by computer. Participants in such a computer conference can take part in discussions and talks, read comments by other participants and enter their own comments. And all this from the desk – according to the application configuration this can be department-oriented, or beyond the location, worldwide.

VAX Notes runs on all of Digital's VAX systems – from MicroVAX systems to the VAXcluster. And since VAX Notes is compatible with the VMS software environment, text editors such as EDT and WPS-PLUS and functions of electronic mail can be used without having to learn new commands. VAX Notes can also be accessed via ALL-IN-1, Digital's office information system.

### More effective discussions with VAX Notes

VAX Notes started in Digital Equipment's development groups. Information should be made accessible to others in the fastest way: product, technology and market-specific questions are answered faster.

VAX Notes makes meeting times superfluous. In a VAX Notes conference you can dial in any time, read the comments of other participants and make your own remarks. Even a late participant is immediately brought up-to-date, he only has to read the discussions which have already been entered.

In a VAX Notes conference all discussion topics and contributions are listed chronologically, so that particular topics can be found right away. The directory gives a permanent record of all contributions to the conference which is accessible to each participant.

Since you can participate in VAX Notes conferences from your desk you save travel time and costs. A particularly important point for people who work far from one another and otherwise could not participate in many discussions.



In large companies it is often difficult to find the right person for particular information or the specialists for a subject field. In a public VAX Notes conference specialists from different working areas have the opportunity to ask or answer questions, seek information or give valuable technical hints without the pressure of time.

The quality of a discussion increases considerably with VAX Notes. Since all contributions are made in writing a participant has sufficient time to organise his ideas and collect all the information he requires. In addition the written word contributes to aiding concentration on essential matters.

#### **Versatile spectrum of use**

The possibilities for the use of VAX Notes are almost unlimited. Thus for example application programmers can use VAX Notes to create test reports and use the "conferences" later as a basis for the documentation.

VAX Notes is the ideal medium for the documentation and introduction of new procedures. In a VAX Notes conference users can ask questions directly about these procedures and receive the answer immediately.

VAX Notes is a "bulletin board". Offers and messages can be left here. Another potential use would be a library in which new entries are announced and documents can be requested.

#### **Data protection and right of access**

In principle data protection is ensured because a VAX Notes conference can be restricted by an authorised person (moderator) to a particular group of participants. The group of people authorised to participate can be extended or restricted at any time.

For those users who want access to remote NOTES conferences, but have no desire to create and run their own meetings locally, a less expensive VAX NOTES Client kit is available.

#### **Anyone can participate**

VAX Notes was created both for users without EDP knowledge and for "computer experts". All VAX Notes functions are called up by commands and for the most used a single key is sufficient. Online help is available for all commands and a sample conference serves as a learning aid for new users.

VAX NOTES gives you the ability to use any callable editor for editing your own notes and responses. These include EDT, EVE, TPU and WPS-PLUS.

VAX Notes uses functions of electronic mail in ALL-IN-1. During a NOTES session, any note or response can be sent to another person in the computer network or a reply sent to the message author.

#### **Keywords and text markings**

By giving keywords contributions about a particular topic can be found. If e. g. several contributions in this conference are about "computer-aided

learning" without the term being explicitly mentioned, these contributions are given the keyword "training" and can then be called up using this.

Keywords are like bookmarks – they identify conference topics in which you may be interested. You simply select a name and mark the contribution which you do not want to forget.

When you first use VAX Notes a notebook is automatically created in your user account. The notebook is your personal list of conferences in which you would like to take part.

The total number of discussion topics is also marked in the notebook and the number of contributions which have not yet been read. You can monitor several conferences at a glance and find the contributions which you have not yet read.

VAX Notes is probably the most heavily used network application, next to mail and VTX, within Digital. Come join the party!

VAX Notes  
VAX Notes Client

Unique product identifier 960  
Unique product identifier VES

#### **Complementary software products:**

Communications system DECnet-VAX  
Office communication system ALL-IN-1

#### **Disk storage capacity (in MB):**

Installation 1.3 Operation 1.1

#### **Complementary information:**

SPD 27.06



# WPS-PLUS and WPS-PLUS/DOS

## Digital's 'Gold Key' Word Processing



- Access to WANG and IBM documents with additional VAX/VMS options

Digital's 'Gold Key' word processing editor, standard for all of Digital's word processing systems, is one of the easiest to use editors available. You can activate all major word processing commands with a simple two key sequence – the Gold Key followed by the appropriate key on the users keyboard. You don't have to memorize different function keys or complex commands. With WPS-PLUS menus and clear labels on the sides of special keys, they're all at your fingertips.

Editing features on VAX-based WPS-PLUS are fully compatible with those of DECmate/WPS and WPS/DOS for IBM Personal Computer systems. These include full ruler support, bold, underline, centering, wordwrap, automatic pagination, justification, headers and footers, go-to-page, global search and replace, cut and paste, subscript/superscript, semi-automatic hyphenation, four-function math and abbreviation and library text.

WPS-PLUS/VMS, with its full screen editor, allows cursor movement up, down, and across the screen either by directional cursor control keys or grammatical movement keys like word, sentence or paragraph. Of course, WPS-PLUS products are fully menu driven, so you can start work quickly and easily.

### Features:

- Digital's 'Gold Key' Editing with integrated filing
- List Processing, Math and Sort
- Verify and correct spelling, capitalisation and word usage, and access to an electronic thesaurus (PC versions have spell checking only)
- Include numbered footnotes or endnotes in a document (VMS version)
- New! Displayed Status Line, Insert/Overstrike modes, Multicolumn Cut and Paste plus Enhanced footnoting
- Redlining, change bars, table of contents generation
- Automatic Index and Table of Contents generation
- Transfer documents to and from a DECmate word processor, or a VAXmate, Rainbow and selected IBM Personal Computers running WPS-PLUS/DOS.

When quality counts



### **Integrated Filing System**

VAX-based WPS-PLUS products come with an electronic file cabinet for each user to store file folders and documents. You can set up your own filing system to resemble the paper system you have now. You can cross-index in different folders, throw out documents and folders, or even go through your 'wastebasket' to retrieve deleted documents. Retrieving documents is easy; you can use keywords as well as document number or document and folder names.

### **Scientific and Technical Editing**

WPS-PLUS supports full scientific and technical character sets such as Greek letters used in maths and science; Boolean characters; and equation components such as large integrals, sigmas and brackets; high bars; and arrow vectors for scientific notation. An equation editor allows technical professionals to create, edit and manipulate complex scientific equations and matrices quickly and easily. WPS-PLUS also comes with a library of predrawn mathematical and technical symbols that can be placed in an equation with a few simple keystrokes.

### **User-Defined Procedures**

User-defined procedures (UDPs) automate those key sequences you use frequently. For instance, the series of commands used to edit a particular document can be compressed into two or three simple keystrokes. Besides saving time, you can satisfy a wide variety of application needs because there's practically no limit to the number of UDPs you can define.

### **Computer Based Instruction and Online Help**

WPS-PLUS computer based instruction is easy to learn and lets you even do your work while you learn to use the system. Online help is always available to provide information about specific features and cross referencing to related functions.

### **List Processing, Math and Sort**

Comparing lists stored on the system against selection criteria you define, List Processing can create customised material such as mass mailings or standard monthly reports. There is no limit to the number of individual elements you can use as selection criteria.

With WPS-PLUS you can perform calculations (addition, subtraction, multiplication and division) while you edit a document during list processing. And you can add the results of the calculations to the document you're editing or processing. It's easy for you to create, update and maintain numerical tables in documents. This feature improves the speed and accuracy of your numeric calculations.

You can also arrange information in a list in ascending or descending alphabetic or numeric order. With a list of names and addresses, you can quickly categorize by name of addressee, name of town or county, or any other address element.

### **Integrated Spelling Verifier and Corrector**

WPS-PLUS comes with DECspell, an integrated spelling verification and correction facility based on Houghton Mifflin's dictionary. Using a single Gold Key command, you can check spelling even while you're editing. The Gold Key command eliminates the need for a separate spelling pass after you complete your work. DECspell can check the spelling of a single word, sentence or paragraph, so you have to check only that portion of the document that you're changing.

If DECspell finds a misspelled or an unknown word, it suggests an alternative and automatically replaces the original word once or throughout the document. Your other options are to ask for more correction alternatives, to manually edit the word once or throughout the document, ignore the word, or to automatically add it to your personal dictionary.

### **Diagram Creation**

WPS-PLUS features a two-dimensional editor for composing diagrams, scientific equations, line drawings, charts and matrices. Draw horizontal and vertical lines to create boxes, enter text horizontally or vertically, and to move entire columns of data.

### **High Quality Output and Printing**

WPS-PLUS can print documents any way you want them — on a full array of draft, letter quality and laser printers. WPS-PLUS provides automatic page numbering, headers and footers, and multi-column printing.

Add the optional DECpage software to WPS-PLUS to produce reports that carry professional print-shop quality. DECpage also permits 'compound documents' — text merged with graphics and drawings. DECpage takes advantage of multiple fonts and true proportional spacing to create high quality office printing, which adds visual impact and professional quality to word processing.

### **EDE Works with IBM DISOSS**

With Digital's External Document Exchange (EDE) Software, you can now use your WPS system to access and edit documents that are prepared on IBM equipment such as Displaywriter, 5520 Administrative System or the IBM 8100/DOSF (Distributed Office Support Facility). You can also create and file documents in the DISOSS database for later access by IBM users.

EDE with IBM DISOSS uses a DECnet/SNA Gateway or VMS/SNA connection to give ALL-IN-1 and WPS-PLUS users access to the Document Library Services of the IBM DISOSS/370. And with its easy to use menu you can file, search for, retrieve and delete revisable-form documents from an IBM host document library.

### **Access to WANG Documents**

For multivendor environments, WPS-PLUS can even edit documents created on a WANG OIS system. Using the optional External Document Exchange/WANG software, you can transfer Wang documents to your VAX computer and have them converted to WPS-PLUS format. Once you edit or modify them through the system, you can send them back to the WANG system.

WPS-PLUS brings DECmate style editing and ease of use to your VAX environment. It's a major step toward providing a common word-processing bond among all of Digital's computer systems.



### WPS-PLUS/DOS

WPS-PLUS/DOS is the implementation of WPS-PLUS for selected MS-DOS and PC-DOS based Personal Computers. It is based on WPS-PLUS/VMS, and is supported on hard disk, 640Kb memory versions of the DEC Rainbow, the IBM-PC/XT and the IBM-PC/AT. It works on all hard disk VAXmates.

### All WPS-PLUS/DOS

implementations possess Modifiable Printer Tables, allowing a user to add support for printers not provided on the distribution kit. They also contain conversion utilities to convert ascii files to and from WPS-PLUS format, and DX files to and from WPS-PLUS format. The latter capability allows WPS-PLUS/DOS text to be fed directly into Aldus PageMaker, retaining all character attributes such as underlining and bolding, without any retyping effort.

Support for selected other types of Personal Computers will be coming soon. Please contact us if you need further details.

WPS-PLUS	Unique Product Identifier AAM
<b>Hardware Requirements:</b>	3Mb Memory above that needed for VAX/VMS. 30,400 blocks on system disk for installation or 17,000 if installation not on the system disk. 13,200 blocks required for permamnent use. See SPD for latest hardware and printer support.
<b>Software Requirements:</b>	VAX/VMS Operating System VAX FMS Forms Driver Software
<b>Optional Software:</b>	DECpage to format text for high quality laser output. DECdx to help transfer dx format documents to and from other systems. Lexicon Options to the resident British English: American Business Lexicon. American Medical Lexicon. French Lexicon. German Lexicon.
Complementary Information in SPD 26.27	

WPS-PLUS/DOS	Unique Product Identifier ELE
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Complementary Information (with a full list of supported hardware, software features and print devices) can be obtained from SPD 30.74.



# EDE/IBM DISOSS

## Maintaining your investment in documents



### Features:

- Document exchange between Digital and IBM systems.
- Library services for editing, searching, relocating and deleting documents.
- Distribution functions for documents in Digital/IBM systems.
- Setting up distribution lists.

The entry visa

The EDE/IBM DISOSS software system is a software add-on to the ALL-IN-1 office information system. With EDE/IBM DISOSS, the user can access textual information in IBM-DISSOSS/370 document databases. DISOSS is the acronym for Distributed Office Support System.

EDE/IBM-DISSOSS offers users of the ALL-IN-1 Integrated Office System a wide range of powerful document processing functions. These include searching, processing, filing, sending and deleting textual information held in IBM-DISSOSS/370 document databases.

In addition to access to documents stored in IBM-DISSOSS/370, the ALL-IN-1 user also has access to documents of other users of the IBM-DISSOSS/370 database, if access is granted. The stored documents can be processed directly by the user in DISOSS or transferred to the ALL-IN-1 office information system. Here the user can process the text as needs permit before transmitting it to different recipients via the Digital Equipment network system.

The user is provided with an easy-to-follow menu interface for quick and simple integration of the EDE/IBM-DISSOSS software package into ALL-IN-1. The functions supported are the same as those in the Document Library Services within the IBM-DISSOSS/370 Office Application. Moreover, the user interface for the text document search, file, seek and delete functions corresponds to the special Digital standards for office applications.

With EDE/IBM-DISSOSS, both DCA (Document Content Architecture) documents in revisable and final form can be processed. EDE/IBM-DISSOSS converts the formatted DCA text of the selected document in accordance with Digital's DX Standard Document File format and transfers the converted document to the ALL-IN-1 File Cabinet.



Generally, the documents transferred from Digital systems for storage in IBM-DISOSS systems are always converted into IBM DCA "revisable form" text format. However, ALL-IN-1 converts ASCII text files transferred via DISOSS/370 into DCA "final form" text format prior to filing in the IBM DISOSS document database.

The search function of EDE/IBM DISOSS creates a directory for the documents contained in the DISOSS database. The directory is then stored in ALL-IN-1, ready for recall. The advantage of this form of organisation

is the considerable simplification of subsequent DISOSS access procedures. To select and process further documents from the DISOSS/370 database, the user only needs the directory of the DISOSS library.

The system manager defines the users of EDE/IBM DISOSS in the DISOSS/370 profile for the IBM host. In addition, he determines access authorisation for the DISOSS document database.

EDE/IBM DISOSS communicates with the IBM-DISOSS/370 through a DECnet/SNA gateway.

#### EDE/IBM DISOSS

Unique product identifier 761

##### Software requirements:

DECnet/IBM network link DECnet/SNA VMS DISOSS (SPD 26.72). With hardware alternative A: Communication DECnet-VAX (SPD 25.03), Gateway software DECnet-SNA (SPD 30.05).

With hardware alternative B: VAX/VMS-IBM network link VMS/SNA (SPD 27.01). With A and B, one of the following products:  
DECmate link DECdx/VMS (SPD 26.36)  
or Office information system ALL-IN-1 (SPD 27.43).

##### Complementary software products:

Disk storage capacity (in MB): Installation 2.1, Operation 0.5

Complementary information: SPD 26.92



# DECpage

## Publishing Add-on to WPS-PLUS



### DECpage – typesetting on the computer

DECpage delivers documents in the best print quality. Letters, circulars, internal memos, lists, reports, documents and papers are “typeset” with the terminal. The output documents meet the highest standard, integrated with text and graphics. Thus effectively prepared documents are produced –without special knowledge about preparing text for printing and graphics design tools.

The user accesses DECpage using WPS-PLUS, Digital Equipment's standard word processing product, and receives high quality text output from the laser printer. DECpage formats the entire document, irrespective of whether it is text or graphics i. e. the correct fonts are selected automatically, lines hyphenated, justified and pages numbered.

### Professional print quality without additional costs and time

DECpage is offered as an extension to WPS-PLUS or integrated in the office information system ALL-IN-1. With DECpage documents are produced cheaply and quickly.

The selection of implemented layout formats e. g. report or memo format, corresponds to usual word processing requirements. These formats can vary according to the user.

DECpage uses proportional character sets which are specially designed for office applications.

### Output on highly developed laser printers

Documents produced with DECpage are output by laser printer. They offer a powerful combination of high print quality and flexibility in font types and sizes and graphics printing.

#### Features:

- High quality text print using defined layout formats.
- Integration of text and graphics
- Integration in WPS-PLUS and ALL-IN-1
- List of layout formats and customer-specific logos.
- User definable representation formats.
- output display of documents on the screen.
- Text layout also in tables or columns.
- Multinational character set
- Automatic creation of an index.
- Half-line spacing

From letters to print



### DECpage combines text and graphics

Documents which integrate text and graphics are created with DECpage. The user determines picture size, determines the picture titles or subtitles and indicates the graphics file in which the picture resides. DECpage locates the graphics file and inserts it at the desired place. If necessary, DECpage pushes the graphics to the beginning or end of the page.

### User definable layout formats

"Individual adaptation to user requirements" means that the user can copy the 37 offered layout formats and then change the following attributes:

- page length and width,
- positioning of the top and left margin.
- position of the marks
- block length and width
- minimum and maximum block length
- margin tabs
- dimensions of the logo
- font types
- interim spaces
- font sizes
- page length and spacing
- margin and paragraph indent
- page numbering
- subtitle e. g. for reports.

### The most important European languages

DECpage supports the multinational character set (MCS) to present the most important European languages, character sets for ASCII and technical symbols to create lines. In addition DECpage contains various hyphenation methods for German, English, French, Italian, Spanish, Portuguese and Dutch. When creating multilingual texts a special languages function and the use of several hyphenation methods within a document is possible.

### Checking on screen

DECpage shows the completed document with its format. Before the user enters the print command, the position of headings, line breaks, spacing between graphics and text or the page break can be checked. The screen presents the end product, thus sample printing for possible reformatting is not required.

DECpage		Unique product identifier AAN	
<b>Hardware requirements:</b>			
Laser printer LN01 (with 256 KB), LN01S; LN03 or LN03 PLUS (each with 2 RAM cassettes); LN03R Script Printer or Print Server-40.			
<b>Software requirements:</b>			
Word processing system WPS-PLUS/VMS; Office information system ALL-IN-1. For laser printer LN01 LN01 Soft Font Library, for laser printer LN03/LN03 PLUS DECpage LN03 Basic Upgrade Complete Office Font Package (Digital Classified Software Library)			
<b>Complementary software products:</b>			
Graphics output DECgraph			
<b>Main storage capacity (MB):</b>		min. 5	
<b>Disk storage capacity (in MB):</b>		Installation 15.4, Operation 13.3	
<b>Complementary information:</b>		SPD 26.29	



# VAX DOCUMENT

## Publishing using a Mark-up language



VAX DOCUMENT is an electronic publishing system which allows VMS users to produce high quality technical documentation. Graphics in sixel format can be integrated in the text.

Digital uses VAX DOCUMENT for the production of most VAX/VMS manual sets.

### Generic Mark Up Language

VAX DOCUMENT is based on a typesetting language independent of the output device. Text and layout commands are input in ASCII text files using any VMS editor. The author creates a source file, enters the text and adds layout commands or comments to identify text elements. Text elements are independent of the total structure of the document and relate to the title, headings, lists or tables. Layout comments do not contain any specific format information. All format information is stored in a separate file and is only used when the file is processed. Thus the user concentrates on entering text and does not need to worry about complex format coding or pagination parameters.

VAX LSE (Language Sensitive Editor) can be used in connection with VAX DOCUMENT to simplify the creation of document source files and the interactive insertion or changing of layout comments.

### Text and graphics

Graphics files can be integrated in the final document. The user determines the size and position of the graphics and merely inserts the graphics file name at the desired place in the documentation. If appropriate, VAX DOCUMENT positions the graphics at the beginning or end of the corresponding or next page.

Users can use their own programs to create graphics files if these support the correct output device protocols.

### Features

- Simple typesetting language (Generic Mark-up Language), simple input
- Consistency of format within one or several documents
- Document management and control.
- Versatile document layout
- Text formatting, graphics integration.
- Integration in productivity tools (LSE, CMS)
- High quality print output of documents.

**Batch Quality**



## Document layout

Various document types can be created and laid out with VAX DOCUMENT. The document type is dependent on the one hand on the text structure, on the other on the text elements which belong to a particular document. Font types, heading size, alternating header and footers determine the varying formats of a document. Each document type is classified into several layout formats.

### Document types provided:

- LETTER: Personal or business letter
- ARTICLE: Two-column or multicolumn article
- REPORT: General document
- MANUAL: Handbook
- MILSPEC: US military specification
- OVERHEADS: 35 mm slides, transparencies for overhead projectors.
- SOFTWARE: User manual with software-specific information.

### Modification

By modifying parameters in the VAX DOCUMENT format file system managers or editors of books can change the document types and their layout individually on:

- Parameters for controlling basic text layout
- Font types for text elements
- Vertical spacing of text elements
- Line width
- Standard texts to identify text elements

## Page layout and page break

VAX DOCUMENT has a powerful text formatter. It offers the following capabilities:

- Automatic numbering of headings, sections, lists, subdivisions of lists, chapters, appendices.
- Automatic pagination which controls the formation of remaining lines, page numbering.
- Alternating headers and footers.
- Footnotes.
- Hyphenation and justification (right or left)
- Complex, multipage tables and formulae.
- Multicolumn printing.
- Horizontal lines.
- Automatic creation of list of contents and keywords.
- Automatic cross-references.
- Multinational character sets.
- Formatting of complex mathematical equations to a complex matrix.

## Complete book production

After completing the contents VAX DOCUMENT brings the corresponding files including contents and keywords together to form a book. The user creates for this purpose only one general layout file in which list and file names and their sequence is defined.

### Quality printing

Created documents can be output on any character-oriented Digital terminal and line printer.

However, VAX DOCUMENT also prepares high quality text and graphics files for printing on the LN03, LN03 PLUS, LN03R and LPS40 laser printers.

Character fonts for the LN03 and the LN03 PLUS are available separately, while fonts for LN03R and LPS40 are contained in the devices themselves.

## VAX DOCUMENT

### Unique product identifier VEE

#### Hardware requirements:

For LN03 or LN03 PLUS laser printer  
LN03R or Print Server-40 Post Script  
Printers

#### Complementary software products:

ALL-IN-1

#### Disk storage capacity (MB):

Installation 6.4, Operation 6.4

#### Complementary information:

SPD 27.55



# VAX DECgraph

## Business Graphics



The VAX DECgraph graphics software package is designed for use on systems which work with the VMS or MicroVMS operating systems. With VAX DECgraph, the user can create and process graphics simply and then print them out. The key areas of use for the VAX DECgraph graphics software package include user support in decision-making and the production of presentation graphics.

Clearly structured menus and sub-menus ensure that the system functions are simple to use. The user selects the options offered by VAX DECgraph using the cursor control keys on his system keyboard. The installation package includes a series of examples to explain the various functions. The display colours can be selected from the system colour palette.

### Features:

- Bar charts, overlaid bar charts, representation with or without shading, plus stacked bar charts.
- Pie charts. Full representation, or with sections of the pie highlighted.
- Linear or logarithmic scaling.
- Automatic assignment of chart captions (legends).
- Constant user support in the form of extensive help functions. These enable the user to check the accuracy of his input at any time.

**Transform your figures  
into pictures**



- Support from comprehensive help functions and documentation.
- Direct output to the plotter may use ReGIS black/white or ReGIS colour modes. In addition, there is the facility to spool data to printer queues.

VAX DECgraph can be addressed by any high-level programming language by means of the VAX calling standard. In this context, the program may be created directly via a program

interface, without using the keyboard. VAX DECgraph therefore permits reprocessing of data from different programming languages. The same applies for information from databases and text editors transferred directly into the graphics system. A special interface is also present for communication with VAX DATATRIEVE. In this way structured values from this query language can also be represented in VAX DECgraph.

#### VAX DECgraph

Unique product identifier 360

##### Complementary software products:

Query language and report generator VAX DATATRIEVE; Spreadsheet program VAX DECalc and VAX DECalc-Plus

Disk storage capacity (in MB):

Installation 2.5, Operation 0.8

##### Complementary hardware products:

Ink jet printer LCP01, colour monitor VR241, laser printer LN03, matrix printer LA12, LA50 or LA75.

Complementary information:

SPD 26.07



# VAX Xway

## Bidirectional Spreadsheet Translator



The VAX Xway formatting program has been developed specially for exchanging data and models produced by different spreadsheet systems. The following formats are supported by VAX Xway:

- DIF (Data Interchange Format). The spreadsheet programs VisiCalc from Visi Corp and SuperCalc from Sorcim, for example, use this format.
- SYLK (Symbolic Link File Format). This format is used, for example, by Microsoft's Multiplan spreadsheet program.
- WKS (Lotus 1-2-3)
- VAX DECalc dump files.
- ASCII files with delimiters between the individual data elements. ASCII files are used, for example, with dBase II, VAX DECalc, Supercomp-Twenty and 20/20 from ACCESS Technology.
- PCSA placed files can be sent straight through Xway without any other file conversion effort.

### Features:

- Format conversion program for universal use.
- A wide range of processing facilities for conversion of data and models.
- Command line interface for users who already have experience of the system.
- Once definitions have been set up, they can be accessed at any time.
- Full use of the multiple formatting facilities of the system, based on a clearly structured user interface.

Conversion with no charges



In addition, VAX Xway also offers a series of extra processing facilities for data and model conversion:

- If necessary, data can, for example, be converted into output file models without formulae.
- Furthermore, there is the option of converting columnar data in the input file into row data in the output file.

By virtue of its clearly structured user interface, VAX Xway leads the user step by step through the conversion process. This means that the user can

make full use of VAX Xway's many conversion facilities in the shortest possible time. If necessary, the user can also call up the system help functions at any time. The screen will then show explanatory information in the context of the functions currently in use.

The user is able to store information which has already been used and retrieve it subsequently.

For users who already have some experience of the system, a command line interface is provided.

#### VAX Xway

#### Unique Product Identifier 729

##### Complementary software products:

Spreadsheet programs

VAX DECalc, VAX DECalc-PLUS

VAX programming languages

Disk storage capacity (in MB):

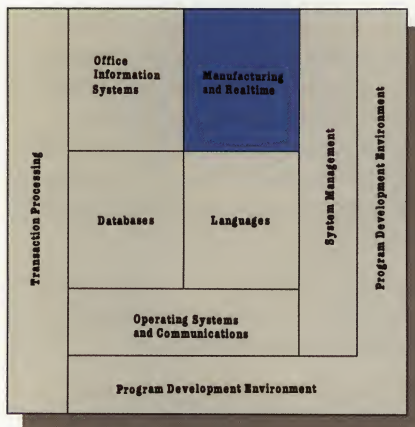
Installation  
1.2

Operation  
0.5

Complementary information in SPD 27.36



# Manufacturing and Realtime



## Technical Databases

### VAX EDCS

VAX EDCS (Engineering Data Control System) is a management system for distributed, heterogeneous information media based on the VAX Rdb/VMS relational database.

### VAX EDCS Local Server

VAX EDCS services from each node in a network.

### BASEVIEW

Access to drawings produced by different CAD systems, via an IGES interface.

## Connection of measurement and control instrumentation

### VAX DECscan Toolkit

Connection of industrial measurement and control instrumentation to the Q bus on MicroVAX II systems.

## Development of real-time systems

### VAXELN Toolkit

Dedicated real-time system, programmable in PASCAL. VAX/VMS development environment for development (VMS) and target (VAXELN) systems which are linked via Ethernet. Application software can be blown into ROM (Read Only Memory) or loaded onto the target system from diskette or via the network.

### VAXELN/Ada

Dedicated real-time system, programmable in Ada. VMS development environment for development (VMS) and target (VAXELN) systems which are linked via Ethernet. VAXELN/Ada complies with the ANSI MIL-STD-1815-A-1983 standard for Ada compilers.

### VAX Rdb/ELN

Relational database management system analogous to VAX Rdb/VMS (SPD 25.59), for dedicated relational database applications running under VAXELN systems. Applications under VAXELN can also access VAX Rdb/VMS databases on the network.



# Manufacturing and Realtime

## Helping to produce Quality

Today, electronic data processing is already an established component of all type of business, from manufacturing to administration, though in general only in "islands" of automation. This means that individual divisions of a company may indeed have become more productive but company operations as a whole have not yet been optimised. Real success can be achieved only when information flows between all departments and across all levels of the company without restriction and without bottlenecks.

An integrated flow of information, the basis for Computer Integrated Manufacturing, is possible only if the hitherto isolated islands of automation can communicate with each other. This stands or falls on a powerful network. Open, fully compatible architectures and problem-free links between them are a pre-requisite for business success.

Digital Equipment is the leader in computer networking technology. Distributed data processing, networking capability, compatibility and system flexibility are a part of Digital's product philosophy: the computers in the VAX family have become standard systems for Computer Integrated Manufacturing.

The capability to use any VAX guarantees that a user gets the right system with the right capacity to fit the requirements – from the Industrial VAX for production machinery to the largest VAX 8800 cluster in distributed data processing.

The binary compatibility makes members of the VAX family some of the most flexible computers available, with the option of trouble-free (re)deployment as needs change.

Digital has an architecture which makes it possible to link together different domains and standards. This architecture is designed so that even substantial changes in computer technology or application do not compromise the overall solution. Only in this way is it possible to ensure a long-term manufacturing strategy for the enterprise and to protect it's investments.

Digital supplies standard products on which you can build. We also offer a range of project and consultancy services that address all aspects of computers in manufacturing environments. Please contact you local Digital Representative for further details.



# VAX EDCS

## Technical database



### Features:

- Archiving of technical documentation in the form of a relational database.
- Reduction of project costs thanks to automatic modification service.
- Security of documentation and data.
- Checklists and intelligent filing.
- Calling up and querying documentation.
- Simple user interface.
- Automatic indication in the event of changes in documentation status.

VAX EDCS is used for automatic management and supervision of technical documentation, with the support of a relational database. This software system speeds up the flow of information and increases data security in design, planning and development departments. At the same time, project management is considerably simplified. The result: decisive improvements in productivity in the entire area of documentation.

One important objective in the development of VAX EDCS was the implementation of full compatibility with the communication systems and application programs in use. For the user this means that he can integrate products, even those from different manufacturers, into a single linked system. The system also offers facilities for checking and accessing data which is archived on microfilm or which exists in printed form.

A clear separation between users, network, data management and database is ensured in VAX EDCS by a division of system functions into different levels. This hierarchical system design makes the VAX EDCS software package an efficient data management system for distributed CAD/CAM applications.

- The automatic modification service in VAX EDCS ensures that only those files which contain correct information and which are fully up-to-date are used. This also has positive repercussions on development times. Furthermore, duplication of development work is eliminated. VAX EDCS distinguishes between development projects which are still in progress and those which have already been completed but which are still in the test phase, and released documentation. VAX EDCS reports changes and provides the user with the most recent version of a file in each case.
- Technical documentation such as diagrams, operating manuals or technical drawings is produced at considerable expense over considerable periods of time. The information it contains is of immense value to the company. VAX EDCS is therefore equipped with the functions necessary for guaranteeing confidential handling of data.

Order in Diversity



- VAX EDCS offers the user the possibility of individual matching of access authorisations to individual employee functions. By means of the system access authorisation lists, for example, an engineer can simply define which of the colleagues working on a project can carry out which operations on a specified file. Corresponding authorisation can be assigned to each VAX EDCS user individually for operations such as copying, modifying or deleting.

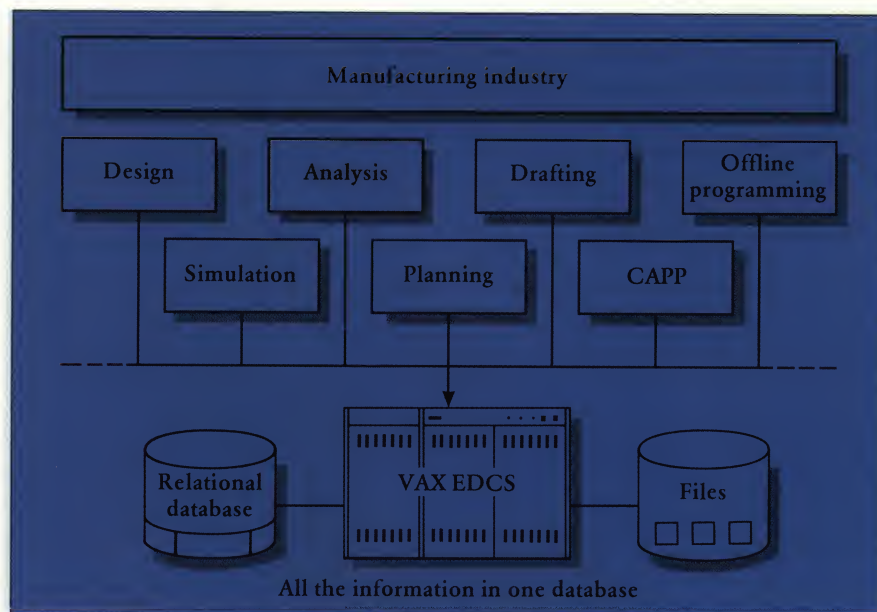
- By means of a checklist internal to the system, it is possible to verify precisely who carried out which operations and when. In order to increase data security further, the system user is required to specify the reason for a given modification. Only then will this be executed and accepted by VAX EDCS.

- The tasks performed by VAX EDCS also include the management of information relating to the technical documentation stored on the system. This includes, for example, modification and access reports, as well as grades of confidentiality for specific technological developments.

- VAX EDCS offers the user rapid access to this information via simple query commands, e. g. SHOW HISTORY or SHOW RELEASED. With commands of this type, in simple English, engineers and project managers can obtain a quick overview of project progress.

- VAX EDCS offers the user the benefits of the VAX Rdb/VMS relational database system. This system, which is being used in the ongoing development of the VAX EDCS system, offers the user flexible access facilities to the powerful functions of the VAX Information Architecture, allowing rapid responses to customers or other departments within the company.

- With VAX EDCS the user can archive data which is not currently needed on magnetic tape. Information on archived documentation is reported "online". This means that VAX EDCS can supply the information required at any time. The data medium on which



an archived file is stored is immaterial. If the user subsequently realises that he needs the archived file, he can arrange for the operator to reload the desired documentation by means of a RETRIEVE command.

- Colleagues working together on a project are kept informed of important

changes to documentation by electronic mail. Co-workers have the option of requesting an updated version of the amended file. This ensures that even engineers in large corporations with several subsidiaries are kept accurately informed of the most recent developments.

## VAX EDCS

Unique product identifier

518 (full)  
380 (remote)

### Software requirements:

Communication DECnet-VAX (EDCS Remote Interface)  
Runtime system VAX Rdb/VMS (EDCS Server Nodes)

### Complementary software products:

VAX Information Architecture products (VIA); VAX programming languages;  
Graphics access system BASEVIEW

Main memory capacity (MB): min. 4

Disk storage capacity (in MB): Installation Operation

VAX EDCS Remote Interface Option 7.5 1.5

VAX EDCS Server Software Option 7.5 4.3

Complementary information: SPD 26.39



# DECintact

## Transaction Processing Monitor



The software for implementing a transaction-processing solution is like a set of building blocks. Each block represents a subsystem providing a different portion of the overall system functionality. The highest block is the applications program; the lowest is the operating system.

Between the applications and the operating system is the software that allows these blocks to communicate in order to process transactions. In providing this interface, DECintact performs services such as managing the terminal network, controlling access to the databases, recovering the databases, and ensuring the systems' security.

### Terminal Management

DECintact's terminal-management subsystem handles all the I/O between the user and the application. The subsystem can even be run on a different VAX system than the applications, enabling the organization to distribute the terminal-management activities across a network. Using standard asynchronous terminals to simulate block-mode devices, the terminal-management subsystem provides modifiable editing routines that assure form validity before the field information is forwarded to the application itself.

Because DECintact forms are created within the terminal-management subsystem and are not hard-coded into specific applications, the forms can be used by different applications simultaneously. The application needs only to specify what form it requires, and the terminal-management subsystem calls the form to the terminal. Forms are created interactively on the screen, and fields can be assigned numerous attributes, including non-echo, encrypted numeric, financial shorthand, blinking, bold, fixed-length, and required. These attributes can be modified at runtime, should the application require it.

### Features:

- High Performance TP Monitor that runs on the full line of VAX systems
- Integrates with application code written in 3GL languages including COBOL, C, BASIC, FORTRAN, PASCAL and PL/1
- Provides an Application-independant restart/recovery system
- Comprehensive Security features, including one-way encrypted passwords, geographical restrictions and hours-of-operation definitions
- Sophisticated disk and memory based queue operations
- Exceptionally well integrated terminal forms manager
- Supports multi-national character sets

Classical TP using a  
3GL language



### Security and Network Management

DECintact's dispatcher subsystem controls the security of the transaction-processing system. It screens users at several layers, beginning with the DECintact system password, and then by other attributes determined by the system manager. The authorization file within the dispatcher subsystem provides a user access only to those applications and features that the system manager or security manager has enabled for that user. To deter unauthorized access further, a terminal profile that assures the geographical location of the user, entitled hours of operation, and other variables can be imposed.

The dispatcher also knows where the applications reside and ensures that those applications, perhaps spread over the network, are available to the user. Whether applications requested are local or remote, they are transparent to the user.

For accounting purposes, the dispatcher time-stamps each request that it handles. Through the dispatcher subsystem, DECintact enables an organization to monitor response times and system loads easily.

### File Management

DECintact relies largely upon Digital's RMS (Record Management System) services for file management. RMS supports indexed, sequential, and relative file organizations. For increased performance, it provides hash file record access and can access records sequentially, randomly, or by record file address (RFA).

### Queue Management

Because of the high demands placed on the organization's transaction-processing system, effective queue management is a must. DECintact provides both memory- and disk-based queue support. It can define up to 100 priority levels and can access items in a queue either in First In First Out (FIFO), FIFO by priority level, or direct item access methods.

### Restart/Recovery Management

DECintact's file- and queue-management systems work in conjunction with the restart/recovery facilities. And all file and recovery operations can be clustered- that is, through VAXcluster system redundancy schemes, users can create a highly available transaction-processing environment.

Both roll-forward and transaction-backout strategies are available. The roll-forward scheme maintains a journal file of "after" record images to recover the database in the event of a media failure. The transaction-backout scheme maintains "before" record images to restore the database to a consistent state in the event of a system crash.

### Digital Transaction Processing and the Future

Your transaction processing needs and applications will, like your business, change over time. You may need more power, new applications, a wider distribution of resources. You may simply want to incorporate new technologies or take advantage of new opportunities. With Digital and with DECintact, your investment in transaction-processing is never at risk and never an obstacle to growth - because your transaction-processing system can evolve to meet your future needs.

DECintact:	SPD 29.58	UPI- VF1 (Development) VF2 (Runtime) VF3 (Remote Access)
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Approx Size:	32,000 blocks (installation) 31,000 blocks (permanent)
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#### Complementary Software:

DECnet-VAX  
VAX BASIC  
VAX C  
VAX COBOL  
VAX Common Data Dictionary  
VAX Fortran  
VAX PASCAL  
VAX PL/I  
VAX Volume Shadowing



# VAX RMS Journalling

## Keeping track of mission critical data



VAX RMS Journalling is a powerful software tool to ensure data consistency and integrity of data records based on the VAX/VMS RMS subsystem (Record Management Services).

VAX RMS Journalling gives the user the ability to include changes made in a file or to make them retrospectively. The risk that typing errors or the unintended deletion of files will lead to the loss of important company data is almost excluded. Time-intensive recovery work is not necessary since the error-free state of a file can be re-established using the journal. VAX RMS Journalling offers three types of journalling:

### After Image Journalling

In this case the user can correct undesired manipulations in a file (REDO function). Even in the case of complete loss of data, for example owing to disk head damage or unintentional deletion of a file, the current state of the file(s) can be achieved.

Regenerating the contents is based on the last backup copy. Any modifications made in the meantime are included up to the desired time based on the journal which is kept.

### Features

- Protects RMS data files from loss and inconsistency.
- Three different methods of journalling: after image journalling, before image journalling, recovery unit journalling.
- Supports all RMS file organisations: sequential, indexed and relative
- Activation using simple DCL commands.

Recording the changes



### Before Image Journalling

With Before Image Journalling various modifications in a file can be made from a moment in time retrospectively (UNDO function). This is useful when a file was expanded with erroneous or incorrect data e. g. because of a faulty line or operational error.

Backup copies of files are not required in this method. The file is "turned back" to the desired time using the journal which is kept.

### Recovery Unit Journalling

Recovery Unit Journalling ensures transaction integrity. A transaction consists of a number of RMS recording operations on one or more files which can be considered as a single operation.

### Supporting all RMS file organisations

RMS Journalling can be used both on one or several files. A file can be marked for one of the journalling types or for a combination.

The three journalling methods can also be combined as desired within an application.

The product can be used for all RMS file organisations: index sequential, sequential and relative.

### Which method for which error situation?

Causes of error	Journalling		
	After Image	Before Image	Recovery Unit
Head crash	X		
Intentional - deletion - overcopying	X X		
Updates with - incomplete files - destroyed files	X X		
System error	X	X	
Application error	X	X	
Incorrect inputs	X	X	
Data consistency after error (e. g. power failure)			X

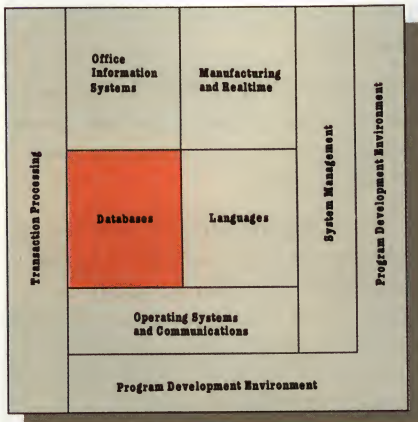
### VAX RMS Journalling

### Unique product identifier VDV

Complementary software products:	VAX Volume Shadowing
Disk memory capacity (MB):	Installation 1.3, Operation 0.8
Complementary information:	SPD 27.58



# Databases



## VAX CDD/PLUS

Common data dictionary, local access-controlled collection of global data for products in the VAX Information Architecture.

## VAX DATATRIEVE

Query language and report generator (text, tables, graphics), with uniform access to data in RMS, Rdb and DBMS files.

## VAX DBMS

Universal, complete CODASYL database in a multi-user environment for simple hierarchical structures to complex network structures corresponding to the ANSI Data Definition Language Committee Working Paper of March 1981.

## VAX Rdb/VMS

Relational database management system complying with the C.F. Codd definition. Applications have access to VAX-Rdb/VMS and Rdb/ELN databases on the entire enterprise-wide DECnet network. VAX SQL is now bundled with VAX Rdb/VMS.

## VAX Data Distributor

From a relational source database (VAX Rdb/VMS, VAX Rdb/ELN or VIDA), generates copies or subsets of this database on the same central processing unit or on remote machines. Two options for data distribution – the extraction method (transfer of all data in the subset) and the replication method (transfer of changes only).

## VAX TEAMDATA

TEAMDATA allows an enduser to create, manipulate and generate reports/graphs from Rdb databases.

The User Interface to the database is similar in a style to a spreadsheet, but using WPS-PLUS key conventions.

## VAX ACMS

Application Control and Management System for development, control and maintenance of transaction systems. See the Transaction Processing Section for further details.

## VAX DECintact

Transaction Processing Monitor that is callable from a 3GL language and which works in conjunction with RMS files.

See the Transaction Processing Section for further details.

## VAX TDMS

Terminal Data Management System for interactive, screen-based applications with non-procedural language for form creation, data exchange between screen and application, control of the logical link between the terminal and the database. See Program Development Environment section.

## Access to IBM databases

### VAX/IBM DATA ACCESS (VIDA)

When VAX and IBM are linked, VIDA allows read/write access to Cullinet IBM databases (IDMS/R, native VSAM). Access facilities from VAX Rdb/VMS, VAX SQL, programming languages as well as from VAX DATATRIEVE query languages. Access to IMS/DLI, TOTAL, ISAM after data extraction on the IBM computer is also possible. A DECnet/SNA VMS 3270 Data Stream Programming Interface is required.

### VAXlink

Allows transfer of many types of IBM mainframe files and database contents onto an Rdb equivalent. Source data accessible by VAXlink include MVS, CICS, IMS/DC, TSO, RACE, TOPSECRET, IMS/DB and VSAM.



# Databases on the network

Databases are the heart of many commercial systems and to an ever increasing extent technical and scientific systems as well. Consequently, dealing with databases is becoming an essential component of designing and developing applications.

For Digital this area has become a focal point for development of its own basic products. In the process, Digital is implementing a strategy of offering application developers interfaces with databases which conceal details of the method of storage and the physical structure of memory. In this way it is possible to create applications as if they are accessing a single, local database which is available at all times, even though the databases actually being used may have distributed structures, remote installations or other complex physical characteristics.

This flexible approach is based on the networking capabilities of Digital systems and as a result guarantees a consistent interface for all database applications, even when the database being interrogated exists at a given point on the network (as is already the case at present) or as a distributed database.

## Two Database Models

In past years, Digital has encouraged product development for hierarchical or CODASYL database technology (VAX DBMS) and for relational database technology (VAX Rdb/VMS). The technology which is employed for a planned application depends on various constraints. In general, VAX DBMS may be recommended when both the structure of the data and the possible queries for the lifetime of the application are clear, understood and relatively constant. The VAX Rdb/VMS relational database organisation should be used for flexible and constantly changing data structures. Modifications to data structures and ad hoc queries can be implemented simply in this data model. In addition, the relational database model has advantages if data is distributed over the computer network. In the future, Digital will be maintaining and continuing to develop both database models.

The CODASYL and relational databases are supported on VAXcluster configurations and can be configured into a highly fault-tolerant system with data shadowing (VAX Volume Shadowing) and duplicated disk attachments. Modification of existing application software is not necessary even if the configuration is subsequently modified.

## Access to external databases and metadata

Digital has already taken the first steps towards expansion of relationally structured central databases to distributed databases: the DSRI interface (Digital Standard Relational Interface), details of which have been published, decouples the logical structure of the database from the physical storage details. In the first phase of this development, now completed, remote access and automatic distribution of data to remote computers are possible.

The DSRI interface also permits access to external databases (e. g. relational databases on IBM systems — see VIDA) and the implementation of standardised query languages such as SQL.

## Simplified Programming

The VAX BASIC, VAX COBOL, VAX FORTRAN and VAX Pascal programming languages offer generic database commands for the VAX Rdb/VMS relational database, which are implemented by precompilers. This considerably simplifies programming of transactions. Other languages have access to the same facilities through a subroutine call mechanism.

Apart from the classically structured query languages and report generators VAX DATATRIEVE and VAX SQL, fourth generation products are also available for end users who are inexperienced with computers: VAX TEAMDATA and VAX DECdecision.

## Service

Digital offers a wide range of project and consultancy services especially for database and transaction processing applications. Further details are available from your local Digital Office.



# VAX CDD/PLUS

## Data Dictionary



**Structure Data for  
Software Systems**

### Features:

- Allows the sharing of field, record and other data definitions among various VAX languages and VAX Information Management Products
- An integrated component of the VAX Information Architecture.
- Hierarchically structured, active, distributed data dictionary
- Access control list for each dictionary and each data description.
- Utilities for maintenance, testing and reproduction of the data dictionary, as well as maintenance of the access checklist.
- Users can control the use of redundant and inconsistent definitions
- Protect the dictionary against unauthorised access
- Can continue to use existing definitions set up with previous versions of the VAX CDD.

VAX CDD/Plus (Common Data Dictionary) is a central store of data about data, the data dictionary which integrates the products of the VAX Information Architecture and permits common access to centrally stored data records. VAX CDD/Plus is used to store and manage definitions for the following products: VAX ACMS, VAX DATATRIEVE, VAX DBMS, VAX Rdb/VMS, VAX TDMS, VAX BASIC, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal, VAX PL/1 AND VAX RPG II. Data security is ensured by assignment of access authorisations.

VAX CDD/Plus meets all the requirements for consistent data definitions within a project. It decouples the data definition from the program and consequently offers better control over any change to this global data within a project team.

VAX CDD/Plus integrates all products in the VAX Information Architecture. Typically, it stores the data accessed by different products and modules as a common structure. This includes:

- All definitions required for VAX DATATRIEVE (data records, tables, domains, procedures and graphics).
- VAX DBMS schema, storage schema and subschema definitions.
- VAX Rdb record structures.
- VAX ACMS test, menu, application and test group definitions.
- VAX TDMS screen forms.
- Data definitions for VAX BASIC, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal, VAX PL/1 AND VAX RPG II.



VAX CDD offers many advantages in the context of application development and management. The definition of data is extracted from programs and takes place in a logically central location. This avoids redundant and often inconsistent definitions within the various modules of an application. Amendments to data definitions are made in a controlled way at one point and only require recompilation of the application.

Modules in different programming languages can access the same VAX CDD/Plus data definitions. The hierarchical structure of VAX CDD/Plus allows the definition of different projects to be managed in areas logically separated from one another.

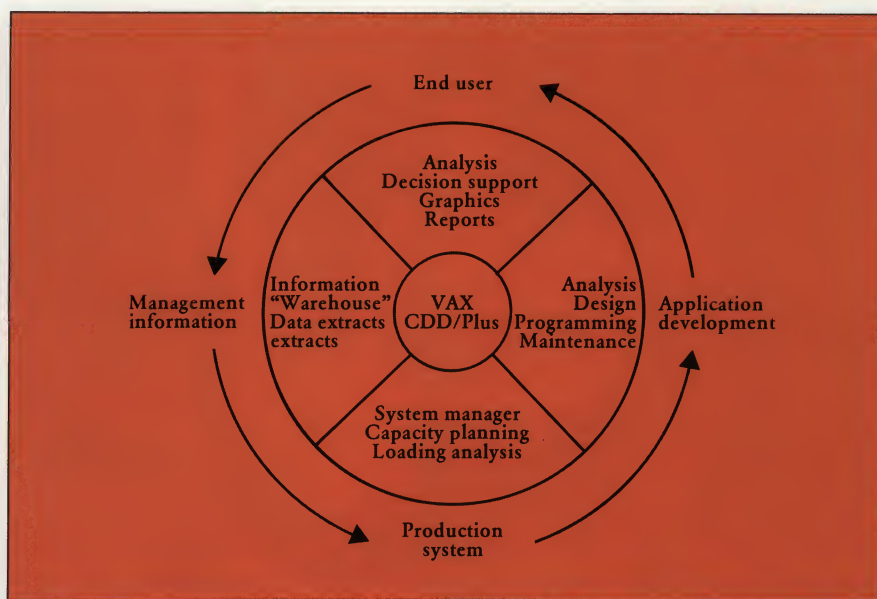
Entries in the data dictionary may originate not only from VAX CDD/Plus but also from the service functions of databases, VAX ACMS transaction systems, VAX TDMS form generators and the VAX DATATRIEVE report generator.

VAX CDD/Plus is composed of one or more physical files which contain a logical, hierarchically structured data directory.

VAX CDD/Plus offers reliable data protection: each directory and each data description may have its own access checklist.

The DMU utility (Dictionary Management Utility), CDDL (Data definition language) and CDDU (Verify/Fix Utility) are used for backing up and reproducing the VAX CDD, for creating and deleting objects and for making entries in the access checklists. It is also able to output lists of contents or selected information on specific objects.

VAX CDD/Plus records all the activities of the data dictionary and includes comprehensive help functions.



#### VAX CDD/Plus

Unique Product Identifier 897

#### Complementary software products:

Transaction monitor  
Forms generator  
Query languages and report generators  
Databases  
Development environment  
VAX programming languages

VAX ACMS  
VAX TDMS  
VAX DATATRIEVE,  
DECdecision  
VAX DBMS, VAX Rdb/VMS  
VAX DEC/MMS, VAX LSE

#### Disk Storage:

Installation 1.4Mb, Operation 0.8Mb

Complementary information in SPD 25.53



# VAX Datatrieve

## Query language and Report generator



### Features:

- Query and processing language, including report generator, for RMS, DBMS and Rdb files.
- Generation of graphics (including colour graphics) such as pie diagrams, bar charts and curve-fitting.
- Distributed access to RMS, DBMS or Rdb files.
- Access to data descriptions in VAX CDD/PLUS (Common Data Dictionary).
- Connection to VIDA if required, to directly access IBM databases

VAX DATATRIEVE is a language for data interrogation and processing, and for generating reports. It offers a uniform method of accessing data which is stored under RMS, VAX Rdb/VMS or VAX DBMS. The data is accessed via application programs or interactively from the terminal. All three data management systems can be accessed within a session.

With the help of VAX DATATRIEVE, even a beginner can call up or modify data without needing to be acquainted with the underlying data structure.

VAX DATATRIEVE represents data in tabular and graphical form and is able to access data on other computer systems in a network.

VAX DATATRIEVE can be used by different groups of users—from the manager, who wants a simple way of obtaining data to support decisions, through organisations whose staff are working on large amounts of data, to the applications programmer who can produce ready-to-run, error-free applications much more quickly. These applications are also extremely easy to modify and adapt to individual user requirements.

VAX DATATRIEVE has a set of powerful English-language commands with a "guide" made to help new users.

VAX DATATRIEVE can be used in three different ways:

- Data can be fetched, modified, stored or deleted interactively, using a simple-to-learn set of commands.
- Commands which are used often can be executed as command procedures.
- All the functions of VAX DATATRIEVE can be used by other VAX programming languages.

**Access to the facts**



### Simple Definitions

One special tool for the development of applications (Application Development Tool) allows record format, RMS files and VAX DATATRIEVE procedures to be defined simply and interactively. The programmer can make use of highly-structured expressions such as IF-THEN-ELSE, BEGIN-END, REPEAT, WHILE and CHOICE. And VAX DATATRIEVE reacts to program errors with detailed, comprehensible error messages.

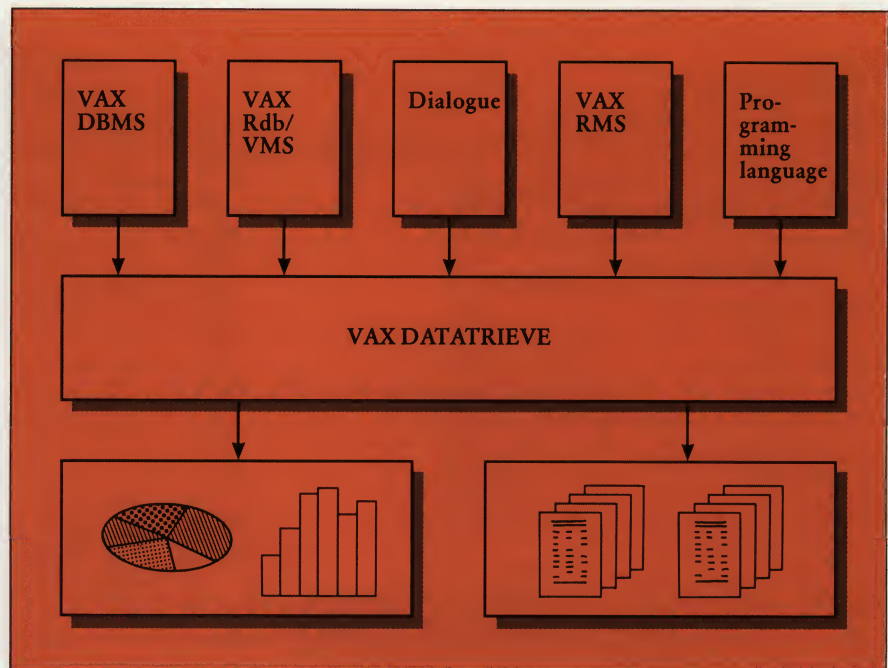
Data structures and their logical memory location are assembled by VAX DATATRIEVE under the designation "domain". Domain generates the relation between the data record and its structure and position, stored in VAX CDD/PLUS. Therefore a single term reveals to the program all the information relating to the record. This procedure simplifies programming considerably.

### Views, Reports, Graphics

VAX DATATRIEVE includes a facility for defining extracts (views). In this way, the users' view is restricted to certain data fields of the database.

Formatted reports can be generated very simply using VAX DATATRIEVE REPORT instructions. They may be sent direct to the screen and printers, locally or remotely.

Data can be presented graphically in the form of bar charts, pie charts and line graphs in an extremely simple manner.



#### VAX DATATRIEVE

Unique Product Identifier 898

#### Software requirements:

Data dictionary VAX CDD/PLUS

#### Complementary software products:

Databases	VAX DBMS, VAX Rdb/VMS
Forms generators	VAX FMS, VAX TDMS
VAX-IBM database access	VIDA
Language-sensitive editor	VAX LSE
VAX programming languages	

Disk storage capacity (in MB):	Installation	Operation
	5.4	4.6

System memory expansion should be at least 1 MB.

Complementary information in SPD 25.44.



# VAX DBMS

## CODASYL Database



VAX DBMS is a database management system complying with the CODASYL standard and integrated into the products of the VAX Information Architecture. VAX DBMS supports simultaneous multi-user access and in so doing guarantees the integrity and security of the individual user databases. The data is accessed directly by applications in high-level program languages or via VAX DATATRIEVE.

The structure descriptions of a VAX DBMS database are stored in VAX CDD (Common Data Dictionary).

VAX DBMS offers the user three different types of access to the database: interactive, indirect via command procedures and programmed (precompiler). VAX DBMS exists as a complete package with the functions of development of and access to existing databases; it also exists in a special version as a runtime system.

### Features:

- Full implementation of the CODASYL proposal.
- Simultaneous access and update facility in multi-user mode.
- Full support of VAXcluster with automatic data recovery in the event of network faults or computer failure
- Online database checking.
- Simple restructuring, with no need to read the whole database back through the system.
- Networking capability under DECnet; access with all functions to distributed DBMS databases.

**Everything in its place**



A database application under DBMS is implemented in the following phases: data definition, schema definition, translation, installation and application development. The subschema, storage schema and security schema are produced in relation to the installation phase.

The schema defines the records, data quantities and areas which make up the database. The schema is the single data definition which has to be created by the user.

#### **Various Logical Views**

The database administrator (DBA) can write several subschemas in order to offer different application programs different logical views of the database.

With the DBQ (Database Query) utility, the user can query, update and store database records interactively. On the screen, the program generates Bachmann diagrams which are schematic representations of sections of the database structure which illustrate access channels.

The Database Operator converts coded schema, subschema and storage schema information from the VAX CDD for the database system into files and control information and generates a database framework which is filled out by user programs. Additionally, the Database Operator provides management routines for all the functions necessary for creation, maintenance, control and deletion of a VAX DBMS database.

Data fields and records, together with most of the dataset designations can be inserted without reading the database and rewriting it into the system. This is particularly useful in the case of applications which are growing continuously.



### **Verification**

VAX DBMS includes a utility for checking the database as well as the correct linking of datasets and formatting of database pages. In addition, VAX DBMS allows several users to access and update the database simultaneously, with automatic dataset locking.

In multi-user operation, the applications programmer does not have to perform the installation and removal of locks by hand when accessing data records. The user always receives a consistent image of the database.

### **Journalling**

VAX DBMS stores all before-image journaling, and optionally over the long term, after-image journaling for all database update operations. These records are used for regeneration purposes after program, system or hardware faults.

### **Several Active simultaneously**

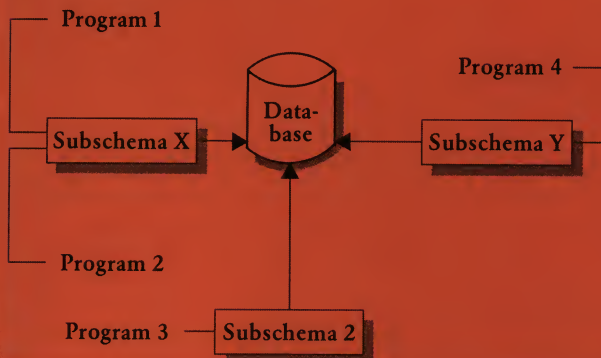
With VAX DBMS several databases may be active at any time. This is particularly advantageous when completely independent data has to be managed in separate databases with different schema. DBMS runs on the complete range of VAX processors, includes support for VAXclusters and symmetrical multiprocessing CPUs.

### **Runtime Version available**

A special runtime version of VAX DBMS is also available. It has all the features and system devices with the exception of the compiler for the data definition language and other elements necessary for developing applications. The runtime version supports applications running on a target computer which have been developed on a host using the development version of this product.



Data independence by separating the logical definition and physical position of the data



VAX DBMS  
VAX DBMS Runtime

Unique Product Identifier 899  
Unique Product Identifier 915

#### Software requirements:

Data dictionary VAX CDD

#### Complementary software products:

Transaction monitor	VAX ACMS
Query language and report generator	VAX DATATRIEVE
form generator	VAX TDMS
Automatic COBOL generator	VAX COBOL GENERATOR
VAX programming languages	

Complementary information in SPD 25.48



# VAX Rdb/VMS

## Relational Database



### Features:

- New! Runtime licence now bundled with VMS
- Fast. Size of database up to 30GB, with a throughput of between 6 and 17 transactions per second
- Fully relational database system complying with the with integrated SQL query language
- Data is independent of application programs. It is possible to modify data definitions without program modifications.
- Journaling and transaction recovery protect against data loss in the event of program or system faults.
- A protection function for data access and updating controls simultaneous access by several users.
- Dynamic Restructuring capability without database reload
- Automatic recovery on a single CPU or a VAXcluster

- Integrity features critical to production applications such as constraints and after-image journaling
- Integrates with a wide range of technologies and products including decision support (TEAMDATA, ALL-IN-1), online transaction processing (ACMS), application generation (VAX RALLY), programmer productivity and Artificial Intelligence tools

### VAX Rdb/VMS – the complete database solution


VAX Rdb/VMS is a relational database management system for simple management of databases up to 30 GB size in a multi-user environment. The database supports an entire range of programming utilities and language precompilers with which relational databases can be produced and used simply.

VAX Rdb/VMS also includes VAX SQL, the Digital implementation of the Structured Query Language, an ANSI standard interface to relational databases. It ensures simple data definition and manipulation. As a result of the advantages of this standard database language VAX Rdb/VMS is an ideal tool for data management. In addition Rdb/VMS databases are suited for online transaction processing because of its excellent performance.

DSRI, our standard for relational database products ensures that all existing and future databases can be accessed via interfaces from languages without programs or procedures having to be rewritten.

**Performance for mission  
critical applications**





With the aid of "selection" and "reduction" operations users of VAX Rdb/VMS can produce extracts or combinations of data records and fields from different relations which appear logically as a single database. They can also define, store and call appropriate extracts by their name if they are needed. With VAX SQL in addition to VAX languages, a high-level software development interface is available for VAX Rdb/VMS databases. VAX SQL can be used as a database query tool, for access to relational databases and for the manipulation of data stored in these databases. VAX SQL offers an interactive data manipulation language (DML), a data definition language and preprocessors for VAX Ada, VAX C, VAX COBOL, VAX FORTRAN and VAX PL/1.

**Relieves: design, production and maintenance**

A VAX Rdb/VMS database is easy to design and understand since the data is organised in tables. The programmer can construct it with a simple set of instructions which are either entered interactively or included in a command file. With VAX TEAMDATA the end user can produce and maintain databases. Application programmers may define their databases with the uncomplicated menus and forms of VAX RALLY.

**The VAX Rdb/VMS guarantee: Integrity and security of data**

A VAX Rdb/VMS database checks the database integrity to the field level and makes it possible to determine access authorisation for physical data and for logical extracts.

VAX Rdb/VMS is equipped with an integrated data dictionary, by means of which the database can be easily restructured and remote access to data definitions made possible. Databases can use the general data dictionary VAX CDD/Plus which allows shared use of entered data by the VAX programming languages and the products of the VAX information architecture.

**Different paths of distributed data processing**

VAX Rdb/VMS completely supports the distribution possibilities of computer resources through the entire company—in a similar manner to Digital hardware strategy. This flexibility is of great advantage for the constantly changing EDP needs in all companies.

In distributed data processing in the Digital style, networked configurations and the physical position of hardware and software including data management are always transparent to the system user. In a distributed environment many individual users or small groups work with their own computer resources and are connected with one another by means of a local area network. Each department can work with their specific database but also access data of the entire company.



As an alternative, computer, user and disk farms can be brought together to form a VAXcluster. In this case VAX Rdb/VMS can be accessed from several processors and automatically reconnect if a processor in the VAXcluster fails. As an option, after image journal files can also be created.

With VAX Rdb/VMS all CPUs in a network have simultaneous access to all Rdb/VMS databases on remote computers in the same network. A relational database application can access both local and remote VAX Rdb/VMS databases if this is required.

VAX Rdb/VMS in a network or a VAXcluster helps to reduce communication costs. The computers can be used more economically and efficiently and system availability can be dramatically improved.

#### **Remote management**

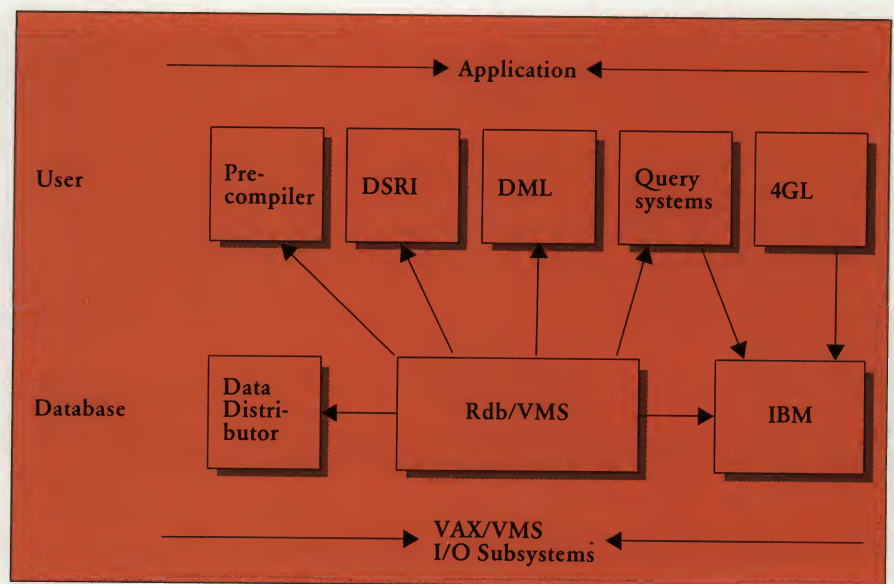
With the aid of the remote management features of VAX Rdb/VMS, a central database administrator can define and maintain databases at remote locations at which it is not desirable to employ dedicated technical expertise. A database application handles each VAX Rdb/VMS database in the same network as if it were local. Users and application programs therefore do not need to be at the same location as data, only somewhere in the network.

#### **VAX Rdb/VMS software packages**

Digital offers three different VAX Rdb/VMS software packages to the development and running of Rdb applications:

- The complete development environment is intended for all areas of use in which applications are developed, errors are investigated and databases are maintained for other target systems.
- The interactive dialogue option supports the implementation of applications which were developed somewhere else, on a target system as well as data definition and interactive interrogation on this target system. Program development is not possible with this option.
- The runtime option only supports the implementation of applications which were developed elsewhere on a target system. The licence for this is now bundled in VAX/VMS -- only the media kit need be ordered.





#### VAX Rdb/VMS

Unique product identifier VD2

#### Software requirements:

communication

For remote access DECnet-VAX

(SPD 25.03)

#### Complementary software products:

Data dictionary VAX CDD/Plus; Transaction monitor VAX ACMS; form generator VAX TDMS; Data distribution VAX DATA DISTRIBUTOR; Query languages and report generators VAX DATATRIEVE, VAX TEAMDATA and VAX DECdecision; Applications generator VAX RALLY; Automatic COBOL generator VAX COBOL GENERATOR; VAX programming languages; VAX-IBM data access (VIDA)

#### Main storage capacity (in GB):

Database max. 30  
6-17 transactions/sec.

#### Disk storage capacity (in MB):

Development system  
Runtime system  
Remote access

Installation	Operation
6.6	4.1
8.6	4.0
4.5	1.9

#### Complementary information:

SPD 25.59



# VAX Data Distributor

## Moving Relational information

Schalter Counter	Flugsteig Gate	Flug Flight	nach to	über via	planen scheduled	verspätet delayed	Schalter Counter	Flugsteig Gate	Flug Flight
122-276	A6 -	BA 727	LONDON-ANNULIERT		1450		658-661	-	LH 366
122-276	B35-	AZ 425	PISA-BOLOGNA		1505		340-344	B -	TP 575
122-276	A13-	PA 644	BERLIN		1510		537-545	B41-	LH 298
324-327	B32-	TK 904	ANKARA-ISTANBUL		1520		490-492	B -	OS 426
122-276	B36-	AH 2931	ALGIER		1540		122-276	B -	LH 034
122-276	A14-	OK 731	PRAG		1540		122-276	B -	LH 248
485-487	B48-	AI 165	PARIS		1550		546-548	B -	LH 114
122-276	A15-	PA 646	BERLIN		1610		537-545	B -	LH 254
122-276	B39-	AF 745	PARIS		1615		685-688	B -	LH 268
122-276	B33-	LH 074	MANCHESTER		1615		122-276	B -	LH 004
122-276	A17-	LH 354	BUDAPEST		1615		122-276	B -	LH 084
679-681	B -	LH 226	ZUERICH		1620		122-276	B -	LH 104

VAX Data Distributor organises the automatic distribution of data which is stored in relational form on several processors.

From a relational source database, VAX Data Distributor can generate one or more copies or subsets of this database on the same processor or on any other nodes on a network. From any database complying with the DSRI (Digital Standard Relational Interface) standard, such as Rdb/VMS, Rdb/ELN or VIDA (VAX/IBM Data Access), data and records can be transferred onto an Rdb/VMS destination database.

### Data Distribution Methods

With VAX Data Distributor the user has two methods of data distribution available – extraction and replication. Extraction describes the complete transfer of sections of the database. In the case of replication, only the changes made to such a section are transferred to the destination system. VAX Data Distributor performs these extraction and replication operations at regular, specified intervals or on demand. To do this, the command syntax which is contained in RDO (Relational Database Operator, part of VAX Rdb/VMS) is used to define the transmission procedures and provide chronological coordination.

The appropriate method is selected according to the requirements of the user and of the application in the destination database environment.

### The extraction method

For each automatic transfer, a new copy of the VAX Rdb/VMS destination database is created. It can be interrogated and updated in accordance with the user's application.

### Features:

- Definition of transfer procedures to local destination databases.
- Transfer of complete partial sections of databases (extraction) or updating of existing sections (replication) on local systems.
- Automatic data transfer with the aid of user-definable schedules or on demand.
- Display of transfer and schedule definitions plus status information.
- Automatic repetition in the event of network faults.

Get to the right place  
at the right time



### The replication method

For each transfer, only the changes (updates) are transferred from the source database to the destination database. With this method, a destination database is first stored for the user and –unlike extraction –no new database is set up when the individual transfers take place.

Only replications of an Rdb/VMS source database are possible. If necessary, data and reports can also be requested from the Rdb/VMS destination database.

VAX Data Distributor permits central storage of definitions, schedules and status information. All transfer definitions, schedules and status information are located in an Rdb/VMS database. This is designated the Transfer Database and supports individual processors or VAXcluster systems. Information on data distribution is implemented with the help of RDO.

### Database Protection

VAX Data Distributor has a wide range of facilities available for securing all source, destination and transfer databases.

To ensure protection of the transfer database, only those users with access authorisation for definitions and schedules can access this transfer database directly.

The source database is protected by protection mechanisms in the database management system. To define an extraction, the user must have read access to the fields and relations described in the transfer definition. Additionally, the DEFINE privilege for the database is required in order to define a replication.

The destination database set up by VAX Data Distributor includes standard access control lists (ACLs) from the Rdb/VMS database. These ACLs can be amended only by the owner of the database on the distributed node.

### Distributed Source Database

The distribution of a source database to distributed processors offers the user numerous new benefits. Thanks to local access, data can be called up more quickly and more efficiently. This is accompanied by an increase in productivity, by comparison with remote access to large central databases. With the distribution of processing loads, better use can be made of the computing resources of the source system and extra capacity remains available to the central processor for other tasks. Furthermore, data distribution means enhanced information control: users have local access only to the information they need. Function-specific data can be distributed specifically to local systems. Access to confidential company information can be restricted to the central database.

#### VAX Data Distributor

#### Unique Product Identifier VDR

##### Software requirements:

Communication	DECnet-VAX
---------------	------------

##### Complementary software products:

Transaction monitor	VAX ACMS
Data dictionary	VAX CDD/PLUS
Query language and report generator	VAX DATATRIEVE,
Relational database	VAX Rdb/VMS
VAX-IBM database access	VIDA
VAX programming languages	
Decision Support	TEAMDATA, DECdecision

Disk storage capacity (in MB):	Installation	Operation
	2.6	1.0

Complementary information in SPD 27.76



# VAX TEAMDATA

## Data Processing for the end user



### Features:

- Direct access to VAX Rdb/VMS databases.
- Fast, simple generation of impressive models, reports and graphics.
- Functions for displaying, printing and storing bar charts and stacked bar charts, polygons, pie charts and scatter diagrams, as well as data from tables or spreadsheets.
- Menu-controlled handling of queries, table extracts, reports and sort runs.
- Transparent calling of data from local and remote VAX TEAMDATA and VAX Rdb/VMS databases.

VAX TEAMDATA offers users powerful but easy-to-use functions for information management. With VAX TEAMDATA's screen-based word processing functions, the user can store data simply in a relational database (VAX Rdb/VMS) and modify it at will.

VAX TEAMDATA offers the user a broad range of facilities for processing and presentation. These include tables, data calculations, reports and graphics. The information may be contained in distributed databases as well as in local, shareable databases.

Furthermore, the user can formulate complex data queries and carry out operations on the basis of compressed datasets. Instructions to the system can be selected simply from the menu displayed on the screen. They may also, however, be entered in the command line. The two methods can be combined.

Data stored locally or in distributed systems, in different formats, can be used jointly by several users. With VAX TEAMDATA the user has direct access to the information contained in VAX Rdb/VMS databases. However, there is also the facility to read information from VAX DBMS databases or RMS files indirectly, using the VAX DATATRIEVE query language.

Data from databases on IBM mainframes can also be read using VIDA. Information can also be copied from PC spreadsheets and standard PC exchange formats using VAX Xway.

whatever you want



### **Tables**

Data can be created and continuously adapted to changed conditions, for individual or shared use, in the form of tables (Rdb/VMS databases). The screen editor complies with the function key assignments implemented in the WPS-PLUS system. The user can therefore process data on-screen without having to learn a complicated data manipulation language. Data can be stored, sorted, updated, interrogated and integrated in reports under menu control, by command entry or by a combination of both options.

### **Tabular functions**

- Display of data on the screen in the form of tables.
- Creation of tables and definition of a mapping format for new data.
- Simple entry, modification and deletion of data, using a powerful screen editor.
- Queries, report generation and data extraction, using menu-controlled selection criteria.
- Transparent data access (local and distributed VAX TEAMDATA or other Rdb/VMS databases). Information can be read from RMS files and DBMS databases by means of the VAX DATATRIEVE query language.
- Facility for generating reports using data from individual or multiple data sources. The data can be sub-divided into subsets and sorted. A control change can also be integrated. The results can be stored and printed out.
- Storage of the results of table link operations in new tables.
- Data sorts on one or more fields.
- Calculations such as TOTAL, NUMBER, AVERAGE, MAXIMUM and MINIMUM, for entire tables or also for groups.



### **Spreadsheet**

VAXTEAMDATA offers the user all the basic functions for performing calc operations. Tables and spreadsheets are created and modified via menus.

### **Spreadsheet functions**

- Direct on-screen processing of data from spreadsheets and formulae.
- Spreadsheets with up to 256 columns and 65 000 rows.
- Expansion of existing spreadsheets, adding new fields, rows and columns (temporarily or permanently).
- Automatic recalculation of formulae.
- User-selectable column width.
- Insert, copy, move and delete rows and columns.
- Trouble-free calculation operations with financial functions such as current value, future value, capital value and depreciated value.
- Mathematical functions such as log, root, and factorial.
- Statistical functions such as TOTAL, MEAN, MINIMUM, MAXIMUM, DEVIATION, STANDARD DEVIATION and NUMBER.
- Printout of formulae or values from spreadsheets.
- Conditional expressions (IF...THEN) with nesting and Boolean comparisons.
- The ERROR function: IF field x is erroneous, THEN replace with field (or value) y ELSE with field (or value) z.

### **Graphics**

The user can use a large number of graphical representations. These include bar charts, stacked bar charts and line graphs as well as pie charts and scatter diagrams. These can be created, printed out and stored on the basis of data from spreadsheet calculations or tables.



### Folder (directory)

Tables, spreadsheets and applications are filed hierarchically in folders. The folders contain a complete directory of the information intended exclusively for the user. In addition, they may contain information on user group access.

### Communication with ALL-IN-1

The following system functions of VAXTEAMDATA illustrate the possibilities of communication with the ALL-IN-1 office information system:

- Function key assignment is identical to the ALL-IN-1 and WPS-PLUS systems.
- Full support of ALL-IN-1's interrupt functions.

- Possibility of integrating reports and text from the VAXTEAMDATA software system into ALL-IN-1 documents or into the electronic mail system (via the ALL-IN-1 notepad).

VAXTEAMDATA can be called from the menu of the ALL-IN-1 office information system.

### Context Sensitive Help

Context sensitive help functions and an integrated learning program ensure that the user can work productively with the system in the shortest time.

Tasks performed frequently may be stored by the user as key sequences which can be recalled and executed on demand.

## VAX TEAMDATA

Unique Product Identifier 741

### Software requirements:

Relational database	VAX Rdb/VMS
---------------------	-------------

### Complementary software products:

Office information system	ALL-IN-1
Applications generator	VAX RALLY
Query language	VAX DATATRIEVE
Data dictionary	VAX CDD/PLUS
Conversion program	VAX Xway

Disk storage capacity (in MB):	Installation	Operation
	8.5	8.2

Complementary information in SPD 27.02.

# VIDA (VAX/IBM Data Access)

## Access to IBM IDMS/R databases



VIDA makes possible direct, transparent read access to IBM mainframe hosted databases. Data can be displayed on a terminal screen, printed or copied into a VAX Rdb/VMS, VAX DBMS database or into RMS files. VIDA works with VAX DATATRIEVE, DECdecision, VAX TEAMDATA, VAX Rdb/VMS as well as with application programs and software tools.

The data collected in VAX Rdb/VMS databases can be transferred from VAX systems to IBM systems on which Cullinet software is used.

In addition VIDA supports the VAX Data Distributor so that transmission of parts of a database from an IBM system to a VAX system can occur automatically at predetermined times.

Users of VAX systems directly access the Cullinet IDMS and IDMS/R databases on IBM mainframes. The VAX user thus has relational access to any types of data in IDMS and IDMS/R databases or VSAM files.

With the aid of the optional COPY function VAX users copy data from VAX Rdb/VMS databases to IDMS/R databases on an IBM system. Data from IDMS/R databases and "native" VSAM files on the IBM system can be extracted and transferred to a database on the VAX system.

VIDA communicates via DECnet/SNA gateways with Cullinet's Information Center Management System (C/ICMS) installed on the IBM side. The Cullinet software accesses the IBM data and transfers it to the VAX system via the DECnet/SNA gateway.

### Features:

- Read access to all databases on IBM mainframes which are supported by the Cullinet Information Center Management System (C/ICMS).
- Access to IDMS/R and IDMS databases as well as "native" ISAM files.
- VAX users can copy files from VAX Rdb/VMS databases to Cullinet databases on IBM systems.
- Standard query language SQL and a number of tested VAX software tools.
- Transfer to data fields and records from IBM databases to VAX databases, files and applications.

**A high-level link**



### Access and data protection

If access to IBM databases in your company is subject to strict restrictions; these can also be implemented fully for VAX users. Data protection can begin on the IBM system where the database management program is installed. It controls access via file contents and the access authorisations for users supplied by VIDA. Access can also be controlled by the IBM security products RACF and ACF2.

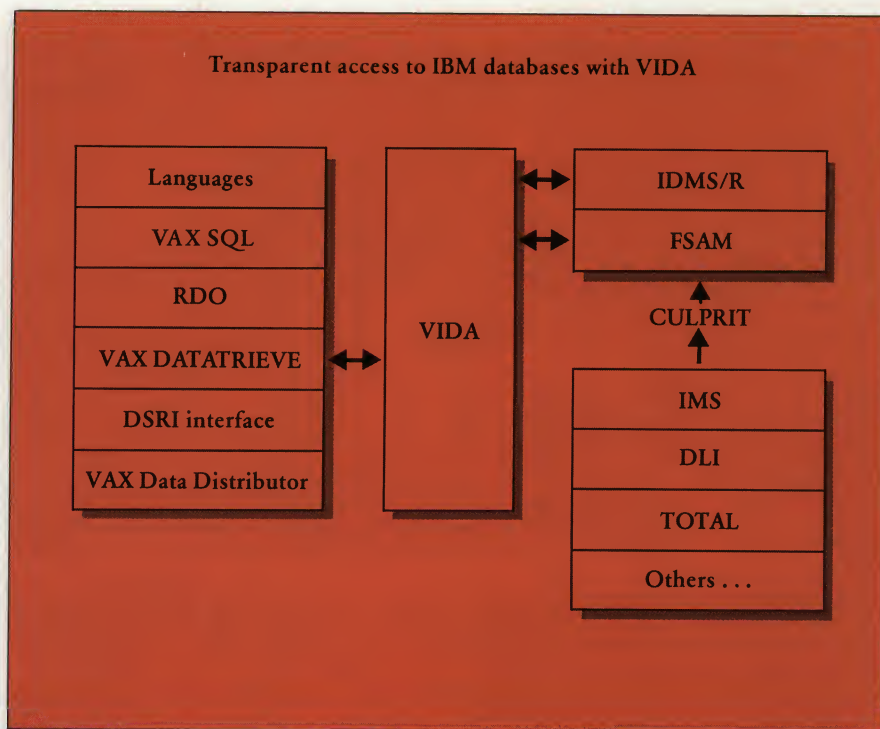
On the VAX side the VMS system manager protects selected or all VIDA access files against access by VMS users who are not authorised to read the IBM databases. With the possibility of excluding protected data when creating access files from storage, data retrieval programs can be set up such that the user must make specific entries before he receives access. In some VMS user interfaces, database access occurs via a path name supplied by the data dictionary VAX CDD/Plus. Since all path names are coupled to an access control list additional security is provided.

### Firstly: overcome incompatibility

VIDA's main task is to overcome incompatibility, which is inevitable when transferring files and data within heterogeneous system environments, transparently as far as the user is concerned. In addition VIDA converts IBM formats into VAX formats: application routines, character set, data storage formats, integrated data dictionary, user input and etc.

### Selective transfer

With VIDA VAX users can distribute subsets of data stocks. However, the main advantage lies in selectively transferring data records and files. VIDA was optimised for selective querying of IBM databases.



### VAX/IBM DATA ACCESS

Unique product identifier B12

#### Software requirements:

Digital software: Interface DECnet/SNA VMS 3270; Cullinet software Teleprocessing monitor IDMS-DC/UCF; IBM software: all IBM systems which support both the required Cullinet software and DECnet/SNA VMS 3270 Data Stream Interface by Digital.

#### Complementary software products (one of the following products):

- 1.VAX DATATRIEVE query language and report generator
- 2.RDO or Rdb precompilers, as included in the Rdb/VMS development package, are required by programmers who wish to develop VIDA applications in languages such as VAX BASIC, VAX COBOL, VAX FORTRAN or VAX Pascal.
- 3.Other applications which adapt to the DSRI protocol for database access, including TEAMDATA and DECdecision.

#### Other complementary software:

Development package VAX Rdb/VMS; Runtime system VAX Rdb/VMS; Interactive option VAX Rdb/VMS; VAX programming languages (Support for programming languages: Data dictionary VAX CDD/Plus); VAX Data Distributor

Main memory capacity (in MB): min. 4

Disk storage capacity (in MB): Installation 1.5, Operation 0.5

Complementary information: SPD 27.25



# VAXlink

## Access to IBM VSAM and IMS/DB databases



### Features

- Flexible access for VMS users to data on the numerous file and database management systems on IBM mainframes.
- The IBM environments and databases which VAXlink can access include: MVS operating system, CICS, IMS/DC and TSO transaction processing monitors, RACF and TOPSECRET security systems, IMS/DB and VSAM.
- Pure read operations ensure complete data protection and full integrity of the files and database systems installed on the mainframes.
- Selection and transfer of data from IBM databases to the VAX/Rdb databases installed on VAX systems with the data dictionary VAX CDD/Plus.
- Various databases on mainframes and VAX systems are supported. Several relations can exist in a single database.

- Selection of special fields, compilation of data queries and execution of Boolean comparison operations by intelligent database access.
- Clearly structured menu interfaces.

With VAXlink an authorised VAX/VMS user obtains access to information on the numerous file and database management systems on IBM mainframes.

The real advantage of a mainframe system is based on the use of the data stored in it which must be fast and easy to call up. VAXlink expands the potential of an IBM mainframe quite considerably.

### Distributed data management

With VAXlink your business uses the advantages of Digital's distributed processing architecture. By using new, productive performance methods for the use of mainframe data this means a high degree of flexibility.

Processing of mainframe data can be distributed to specific departmental and desktop systems. This relieves cost-intensive mainframe systems from tasks of routine information access and retrieval. The data distributed throughout the entire Digital network is accessible to all users – at low cost.

**And Rdb thinks it's local**



### Simplifying access to information

Digital-SNA Gateway is required to connect an IBM mainframe to the VAX or VAXcluster systems. The ANSWER/DB EXTRACTOR software products by Sterling Answer Systems, Inc. must run on the IBM computer from which data is to be retrieved.

To retrieve data from the IBM database the manager of the VAX Rdb/VMS database sets up a task with the interactive, menu-driven program of VAXlink. Each task defines precisely which data is to be selected from the IBM database for retrieval. The task definitions also determine which databases of the IBM computer are to be searched for the desired data. A task can access several databases for this purpose.

When transferring a task the ANSWER/DB EXTRACTOR software running on the mainframe generates the required data as metadata. This is an independent file format which can be interpreted by programs running both on the IBM and on Digital systems. The metadata is transferred to the VAX system and converted by VAXlink into Rdb and CDD formats. Programmers and data managers also use metadata for setting up new applications.

A script processing language is available for automating the log off, log on and data retrieval procedures.

### Mainframe data for VAX applications

The MVS operating system, the transaction processing monitors CICS, IMS/DC and TSO, the TOP-SECRET security system as well as RACF, IMS/DB and VSAM are part of the IBM environments and databases supported by VAXlink.

After transferring the selected database information to a VAX/Rdb database the data can be processed and analysed with numerous tools. Of course system developers can also write specialised application programs to automate database selection and report generation with VAX utilities or program development tools.

This is particularly advantageous for periodic information queries and when generating ad hoc or production reports. Data selected and transferred from IBM mainframe databases is immediately available to VAXlink users when they enter the Rdb/VMS database.

### Database security

VAXlink has read access to mainframe data which cannot be modified in any way. Data and metadata are transferred from the IBM mainframe via the SNA-Gateway to the VAX system.

User profiles eliminate non-authorised data access by special VAXlink security functions. Information system management can specify precisely the users authorised to access a database. In addition it is possible to limit the information access to individual parts of the database.

#### VAXlink

#### Unique Product Identifier VFV

##### Software requirements:

Communication VMS/SNA or DECnet/SNA-Gateway; 3270 DATASTREAM PROGRAMMING INTERFACE; 3270 Terminal Emulator; ANSWER/DB EXTRACTOR; Database VAX Rdb/VMS

##### Hardware requirements:

For VMS/SNA DMB32 or DMF32 Synchronous Adapter, for DECnet/SNA DEBNT or DEBNA Ethernet Adapter

Main memory capacity (MB): min. 2

Disk storage capacity (MB): Installation 1.5, Operation 0.8

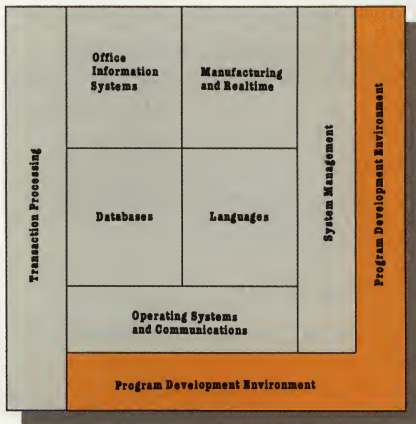
##### Note:

VAXlink supports VAX-11/730 and VAX-11/750.  
VAXstations and MicroVAX 2000 are not supported.

Complementary Information in SPD 29.87



# Program Development Environment



## VAXset

Development environment for creating and maintaining applications with programming languages. The integrated products encompass the areas of version management of documents and sources, creation and analysis of program modules, computer-assisted application generation, and testing to enhance development productivity considerably. VAXset contains:

VAX DEC/CMS	Code Management System
VAX LSE	Language Sensitive Editor
VAX SCA	Source Code Analyser
VAX DEC/MMS	Module Management System
VAX PCA	Performance and Coverage Analyser
VAX/DEC TEST MANAGER	

## VAX LSE

Language-sensitive editor for VAX Ada, VAX BASIC, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal, VAX PL/1, VAX DATATRIEVE, VAX TDMS and VAX Rdb/VMS. Other languages and databases can be adapted and integrated at any time. A component of the VAXset development environment.

## VAX SCA

Interactive static analysis of source code, closely integrated with the language-sensitive editor. A component of the VAXset development environment.

## VAX DEC/CMS

Version management for source code and documentation. A component of the VAXset development environment.

## VAX DEC/MMS

Automatic regeneration of applications after changes, with minimum effort. A component of the VAXset development environment.

## VAX PCA

Testing of the dynamic runtime behaviour of applications and monitoring of the coverage of the test. A component of the VAXset development environment.

## VAX DEC/TEST MANAGER

Organisation of software tests for interactive and batch applications. A component of the VAXset development environment.

## VAX DEC/Shell

A Bourne Shell Unix user interface, running under VAX/VMS as an addition to the DCL VMS user interface, with 60 UNIX utilities (awk, cup, ed, lex, sed, ter, yacc, etc.).

## VAX Software Project Manager

An application that helps managers to manage and cost out a programming project. It also allows contributors to update their own schedules, freeing the Project Manager from this chasing task.

## VAXimage Services Products

Two packages to allow the capture and manipulation of graphic images in a CDA(tm) and DECwindows environment.

## VAX Notes

Computer-assisted conferencing and information system for any number of participants working on different sites. The product is described in detail in the section on Office Systems.

## Forms Software

### VAX FMS

Used for the construction of screen forms which can be used by any application written in a VAX language.

### VAX TDMS

Terminal Data Management System, with non-procedural language for form creation and data exchange between the screen and an application. Stores forms definitions in the VAX CDD/PLUS Common Data Dictionary.

## Graphics

### VAX GKS

Device independent 2D drawing package that supports the ANSI ISO GKS standard V7.2, level 2C. Works in conjunction with VAXstations as well as standard Digital terminals and print devices.

### DEC PHIGS

Sophisticated, realtime, three dimensional graphical support subsystem that controls the definition, modification and display of 3D hierarchical graphics data on a wide variety of output devices.

Closely reflects the ANSI draft PHIGS standard, dpANS X3.144-198X with extensions for hidden surface removal, shading and depth cueing.



## The development environment – unique to VAX systems

Higher productivity and less routine work are the major aims in software development. Modern development tools supply appropriate services quickly, with no errors, and ensure that the development engineer gets the necessary information quickly and accurately. Actual design and programming work is speeded up and improved. The learning effort which is initially required to use such tools pays for itself very quickly.

Many software houses and the DP departments of large companies develop and refine their own tools for software development at their own, considerable expense. Under the name VAXset, Digital offers products for such a development environment running under the VAX/VMS operating system. These products give the user the chance of escaping from the burden of developing and maintaining his own system software products. This also eliminates the financial risks which must always be taken with such product development work.

Using the VAXset products also leads to substantial savings in time in the areas of project management. The entire historical development of a project is recorded, relations in the project are documented and the organisation of test series is supported. The reduced management effort frees time for creative work.

The language-sensitive editor and the closely linked static source code analyser provide the programmer who is developing the program with the correct syntax for the programming languages used as well as the necessary reference information and variables, routine structures etc. With this help alone, the effort involved with generating program code is substantially reduced. At the same time, the error rate is reduced and the quality of the end product improved accordingly.

All the development environment products have a uniform user interface. Functions have to be learned once only and can be used in the same way for all supported programming languages. In parallel, in addition to the current work, some tools can be called up in order to obtain information. Such facilities speed up and simplify ordinary routine work.

Digital uses these products with great success in its own development departments. Production of software products and applications has been able to be accelerated substantially in recent years. Product quality is improved at the same time. The costs for maintenance and further development of products have become calculable.



# VAX LSE

## Language Sensitive Editor



### Features:

- Accelerated entry of source code with the aid of language-specific source code templates (formatted language constructs).
- New! Redesigned to make advantage of Digital's DECwindows desktop environment for Workstations.
- Creation, processing, compilation and verification of programs, plus elimination of compiling errors during a session.
- Parallel editing when testing and checking programs.
- Matching of the editing environment to specific requirements or wishes of the programmer.
- Support for the following VAX programming languages: VAX Ada, VAX BASIC, VAX BLISS-32, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal, VAX PL/1, VAX DOCUMENT and DECwindows UIL procedure calls

The VAX LSE language-sensitive editor supports almost all VAX programming languages. It offers all the characteristics which a programmer needs to do the job professionally.

Integration of the editor in the VMS operating system, in VAX languages and other VAX programming tools produces an excellent programming environment.

VAX LSE promotes a particularly fast and time-saving method of working. Several programming tasks are performed within a single editing session: generation of the source code with the aid of integrated language constructs, automatic linking of error indication and incorrect source code after compilation, and program testing with an integrated source code environment. At the same time, detailed information on the respective programming language can be called up.

Two central features of the editor help the programmer to write source code which is syntactically correct: the formatted language constructs and the help function, which can be called up at any time. The formatted language constructs are available for all supported VAX languages and speed up correct entry of source code. The help function provides detailed general information on all the languages supported as well as specific information on the templates and their elements.

With VAX LSE, the programmer can re-compile the program after changes as many times as required, without leaving the editing session and having to reproduce program listings each time.

### Windowing Technique

The split-screen facility of the VAX LSE language-sensitive editor is suitable for many different programming techniques. The screen offers a window for input prompts and messages plus one or two windows for the actual programming work. The split screen and format can be modified using editing commands. The windowing technique allows

Help when you need it most



overlaying of compiling errors during the editing phase and the automatic assignment of these to the erroneous source code. There is also a facility for displaying and working on two different programs.

### Templates & Command Sequences

VAX LSE gives the programmer constant access to all functions. Other editing aids can easily be integrated. Thus, for example, the language-specific templates of the editor can be modified in such a way that they correspond to the programmer's preferred working methods or project-related coding requirements. In addition, the standard templates developed for the VAX languages can be extended.

The editor can be extended by sets of templates for extra languages. This gives the programmer the option of developing templates, tokens and placeholders for the language employed or for structured and formatted software development documents.

All editing commands and command procedures can be assigned to specific keys. VAX LSE's standard keypad is similar to the keypad of EDT, a text editor which runs under VAX/VMS. The programmer also has the choice of insert or overwrite mode for text entry.

With the VAX LSE language-sensitive editor, an editing environment can be expanded in such a way that it meets the requirements of specific applications or of program maintenance. For this purpose, the editor possesses an interface with the VAXTPU procedure language. It is a programmable utility for word processing and is a component of the VMS operating system.

VAXTPU is a block-structured programming language which is simple to use. Existing procedures can be used to generate the user's own editing routines.

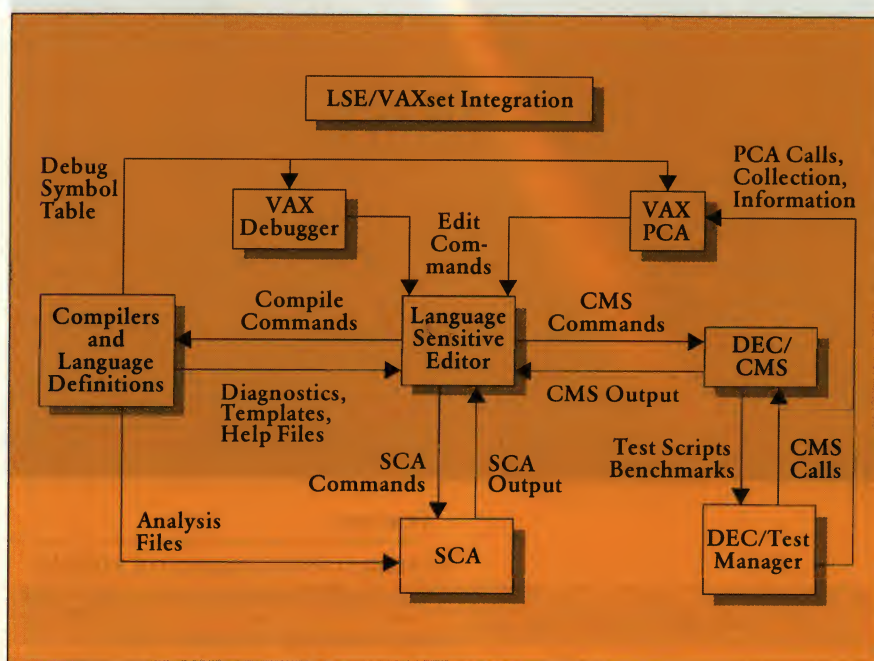
VAX LSE is a fully integrated component of the VAX/VMS environment. All VAX tools which are used subsequently in programming work – compilers, linkers, the VAX

Symbolic Debugger and PCA – can be called direct from the editor. Any errors which occur can be corrected immediately in the source code.

When the editor is called during a program test, the cursor is positioned on the source code line at which the programmer is currently located in the program test. After editing operations have been completed, the cursor returns to the position from which the editor was called.

The VAX PCA (Performance and Coverage Analyser) can similarly call the editor while the programmer is analysing runtime behaviour.

VAX LSE can be used for all editing functions. Templates for preformatted text documents or for memo headers can be constructed without difficulty. In addition, VAX LSE can be called directly from within programs.



### VAX LSE

Unique Product Identifier 057

#### Complementary software products:

VAX programming languages:	VAX Ada, VAX BASIC, VAX BLISS-32, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal, VAX PL/1	
Development environment with	VAXset	
Source code analyser	VAX SCA	
Source management system	VAX DEC/CMS	
Performance analysis	VAX PCA	
Test organiser	VAX DEC/TEST MANAGER	
Application generator	VAX DEC/MMS	

#### Disk storage capacity (in MB):

	Installation	Operation
For VAX LSE only	2.2	≈ 1.1
For VAX LSE with support for all languages	2.5	≈ 1.6
For each extra language	0.25	

Complementary information in SPD 26.59



## **VAX GKS**

### **Graphics Kernel System**



VAX GKS is Digital's graphics system developed on the basis of the GKS computer graphics standard. VAX GKS complies in full with the GKS computer graphics standard for two-dimensional graphical representations. This makes VAX GKS the basis for the development of graphics applications. No special development of device protocols is needed for different hardware systems when VAX GKS is used.

GKS (Graphics Kernel System) has complied with the requirements of the ANSI and ISO standards since 1985. Since this standardisation process, the number of graphics systems and applications based on GKS available on the market has been constantly on the increase. With VAX GKS, Digital Equipment offers users a package which meets the requirements of Level 2c of the GKS standard without any limitations.

Applications based on GKS can run on various graphical input and output devices. VAX GKS supports a large number of different graphics terminals, workstations and printers, including plotters.

#### **Features:**

- Device-independent standard graphics software.
- Full compliance with GKS Standard Level 2.
- Supports asynchronous input facilities.
- Supports compatible Sixel, Postscript, HPGL and Tektronix devices.
- Incorporates VAX FORTRAN and integration of all VAX programming languages.

**Bright Opportunities**



### Device Independance

For the user, VAX GKS also means that he has a lot of latitude in terms of devices and systems he can use. VAX GKS supports compatible Sixel, Postscript and HPGL devices from other manufacturers, as well as Tektronix devices. For this purpose, Digital supplies users with special device drivers free of charge.

### Asynchronous Data Input

Asynchronous data input requirements are taken fully into account in VAX GKS. Asynchronous input of measurement values and events has the advantage that the system can accept further input in parallel with the execution of applications. The application supports dialogue.

### Output, Storage and Transfer

VAX GKS also supports metafile output (CGM) for computer graphics. CGM permits structured storage of image information and ensures trouble-free transfer of the information between different devices and graphics installations.

Apart from the new VT330/340 graphics terminals from DEC, VAX GKS also supports Tektronix 4107 graphics terminals. For creating and processing general geometrical figures, VAX GKS provides prepared control sequences (escape functions), which are not taken into account in the GKS standard.

VAX GKS  
VAX GKS Runtime

Unique Product Identifier 810  
Unique Product Identifier 811

### Complementary software products:

VAX programming languages

VAX Ada, VAX BASIC, VAX BLISS-32,  
VAX C, VAX COBOL,  
VAX FORTRAN, VAX MACRO,  
VAX Pascal, VAX PL/1

### Disk storage capacity (in MB):

Complete product  
Runtime system

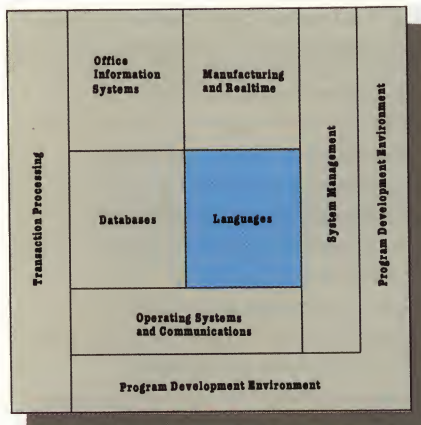
Installation  
3.2  
1.9

Operation  
max. 3.1  
max. 1.7

Complementary information in SPD 26.20



# Languages



## VAX Ada

Validated implementation to ANSI 83 Ada, MIL-1815A. An efficient development environment, thanks to independent management of all translation and linkage editors with full integration into the VMS software environment. In addition, the use of the VAXset development environment is recommended (exception: VAX DEC/MMS, since the function is included in VAX Ada).

## VAX BASIC

VAX BASIC can be installed as an interpreter and as a compiler.

## VAX BLISS-32

Implementation language for system software on VAX systems with direct access to hardware functions.

## VAX C

An extension of the version of C developed by Bell Laboratories; more than 150 UNIX functions in the runtime system.

## VAX COBOL

For commercial applications; complies with ANSI COBOL standard X3.23-1974. VAX COBOL code may be generated by the VAX COBOL GENERATOR.

## VAX COBOL GENERATOR

Generation of COBOL programs from a screen-based graphical specification. Subsequent maintenance of the application at specification level, top-down design, support for prototype development, non-procedural programming, relational (VAX Rdb/VMS) and hierarchical (VAX DBMS) data organisation.

## VAX DSM

VAX Digital Standard MUMPS (DSM), an extension of the ANSI MUMPS X11.1-1977 standard; 32-bit implementation, re-entrant interpreter, simple programming and maintenance of databases which are used interactively. A closed programming and execution system; not a component of the VAX Information Architecture.

## VAX FORTRAN and VAX FORTRAN/ULTRIX

Full implementation of FORTRAN-77 ANSI X3.9-1978 with extensions; supports the Federal Information Processing Standard Publication (FIPS-69). Will run under VMS and ULTRIX-32.

## VAX LISP and VAX LISP/ULTRIX

Implementation of COMMON LISP as interpreter and compiler. Will run under VMS and ULTRIX-32.

## VAX OPS5

Non-algorithmic language for the implementation of expert systems and other applications from the artificial intelligence sector.

## VAX Pascal

Compatible with ISO 7185-1983 (E) and ANSI/IEEE 730x3-97 1983.

## VAX PL/1

An extended implementation of the ANSI-X3.74 standard.

## VAX RALLY

Menu-controlled applications generator for developments in the commercial environment. Simple generation of forms and VAX Rdb/VMS applications, which may be used independently or integrated into VAX TEAMDATA or ALL-IN-1.

## VAX RPG II

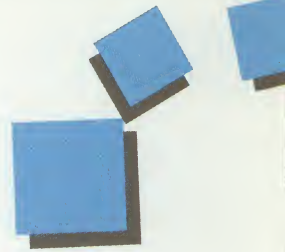
A language for commercial applications, with editor and compiler.

## VAX SCAN

A language for processing character strings and texts for simple implementation of filters, translators (compilers), extractors, preprocessors, etc.



# Languages



You can work on VAX systems with all current programming languages, from Ada through APL, BASIC, C, COBOL, DIBOL, DSM, FORTRAN, LISP, OPS5, Pascal, PL/1 and RPG II to SQL. The outstanding characteristic of the VAX architecture is the way all the languages are embedded in a common, uniform environment:

- Uniform symbolic debugging aid.
- Uniform symbolic error tracing.
- Uniform common runtime library.
- Matching subroutine interface.
- Uniform handling of runtime faults.
- Uniform basic file system.

## Debugger and runtime library

The VAX Symbolic Debugger controls and monitors program execution in the during software development. The interaction with the test system takes place at the level of the programming language which is in use. Symbolic error tracing allows simple error detection during program runtime.

The common runtime library under VMS contains all the universal and language-specific subroutines which are incorporated in many different types of application by the system or by the programmer. The runtime environment is language-independent.

## Common subroutine interface

The matching subroutine interface of the VAX architecture defines and implements parameter passing between all subsystems in the VAX computer system: operating system services, language modules, file system, databases and other software products. As a result, modules in different programming languages can be combined in applications.

Applications-related libraries can be used regardless of the programming language used. A further advantage of the common subroutine interface is the uniform handling of exceptions which occur in hardware or during software use. The file system – RMS (Record Management Services) – is part of the operating system.

## Manufacturer-independent standards

The programming languages offered by Digital meet applicable manufacturer-independent standards. If a programmer observes the standard of a language, developments can be ported relatively easily to other systems. Such porting operations take place very often in practice, since VAX computer systems are also ideal software development systems for other target computers.

## VAX languages: components of VIA

The VAX Ada, VAX BASIC, VAX BLISS, VAX C, VAX COBOL, VAX FORTRAN, VAX Pascal and VAX PL/1 languages are part of the VAX Information Architecture (VIA) and are supported by the development environment products, with an identical user interface. General structure data can be stored in a central location, the VAX CDD/Plus data dictionary, and is then available to all modules of an application. Form generator functions or transaction processing monitors can also be easily incorporated.

There are VAX Rdb/VMS precompilers for VAX FORTRAN, VAX PL/1, VAX COBOL and VAX C to access relational databases. For SQL there are precompilers for language extensions which are converted by precompilers to the level of the standard language. Other languages rely on a standard subroutine calling interface.

## Artificial intelligence languages

Digital currently offers the artificial intelligence languages VAX LISP and VAX OPS5. Under VAX/VMS, they have interfaces with other software products such as databases, but they have their own development environment. Digital has a leading part in developing and defining standards in the area of artificial intelligence.

## The future

In its implementation of programming languages, Digital pursues the objective of offering official standards, which are independent of manufacturers. The development environment complements the programming languages available and, in the long-term, will be extended by computer-assisted design methods.



# VAX Ada

## Programming Language



**New horizons  
for programmers**

### Features:

- Full integration into the VAX/VMS environment.
- Separate compilation.
- Multi-tasking features.
- Strict type assignment.
- Comprehensive diagnostic messages.
- Supported by VAX LSE (Language-Sensitive Editor).

VAX Ada is the validated implementation of the Ada programming language according to ANSI-MIL-1815-A-1983 and has been tested by the "Ada Validation Office" using version 1.4 of the "Ada Compilation Validation Capability". VAX Ada runs under the VAX/VMS operating system and produces optimised re-entrant code. In addition, VAX Ada is incorporated in the VMS standard language environment and the user can therefore access all VMS system services and utility programs.

VAX Ada supports VAX RMS (Record Management Services) including sequential, relative and indexed-sequential file organisations as well as the relevant standard access methods. VAX Ada programs can, moreover, call or be called by modules from another VAX programming language.

One special feature of VAX Ada is support for multi-tasking, implemented by round robin priority control and entry calls. In addition, this language permits a reduction in software maintenance costs thanks to modular program structure and separate compilation.

Ada is a powerful general-purpose programming language with integrated language features which support a wide variety of modern programming techniques and which owe their development to an invitation to tender initiated by the US Department of Defence. The aim was to develop a programming language for integrated systems – with the emphasis on increased ease of maintenance, reliability and portability – which would reduce development and maintenance costs. Ada is the result of this invitation to tender and can be used universally, for example in system programming, computer-intensive programming, applications programming and in particular in real-time environments.

VAX Ada requires strict assignment of data types in the first phase of program development. Since data type assignments are checked as compilation takes place, serious errors can be avoided.



### Separate Compilation

Data abstraction allows the user to concentrate on the essential points of his program without having to bother about the underlying details. The details of the implementation remain concealed from him, while at the same time all the mechanisms enabling him to make use of them are made available.

In contrast with most programming languages, VAX Ada offers language elements to control parallel programming activities without having to access the system services of the operating system directly.

The programmer has the opportunity of sub-dividing large programs and compiling them separately. In this case the library management system provides information on the other compiling units. With other languages, software modules which are compiled separately have only very little information about other dependent modules.

Generic definitions are a special strength of VAX Ada: they are special forms of program units which define algorithms (analogous to the definition of subroutines); the data types remain variable and are only fixed when the program is compiled.

VAX Ada is equipped with an extensive error handling mechanism which makes it possible to trap all possible sources of error.

### Large Scale Projects

VAX Ada is particularly suitable for large-scale projects. The common use of an Ada compilation library, together with the option of shared use of the compiled Ada code, provide an efficient environment for the project team. In addition, Ada allows the definition of individual libraries, as well as automatic recompilation of units which are no longer up-to-date.

### Ada extensions

VAX Ada is fully integrated into a VAX/VMS environment. The following extensions to VAX Ada are supported:

- VMS system services.
- VMS runtime library.
- Access to relative and indexed-sequential files.
- Direct access to VAX-RMS (Record Management Services).
- The possibility of recovering an error caused by non-Ada code, and vice versa.
- Possible access with the aid of global variables to data generated with Ada code.
- Support for the full scope of VAX Ada by the VAX Symbolic Debugger.

### Development Environment

A development environment, VAXset, is offered for VAX Ada and the other VAX programming languages; it increases productivity in software development quite substantially. VAXset removes the burden of administrative tasks from the programming team and increases productivity in the coding and test phases. Interactive on-screen working is fully supported.

VAXset offers the following functions:

- Library for version management of all sources
- Language-sensitive editor and static source code analysis.
- Transparent dynamic tests.
- Administration and organisation of test procedures (e. g. simulation of interactive users).

### VAX Ada

Unique Product Identifier 056

#### Complementary software products:

Data dictionary	VAX CDD/PLUS
Graphical kernel system	VAX GKS
Development Environment	VAXset
Ada for Realtime environments	VAXELN/Ada

Disk storage capacity (in MB):	Installation	Operation
	12.0	12.0

Complementary information in SPD 26.60



# VAX C

## Programming Language



VAX C fully supports all the language characteristics of C as described in the book "The C Programming Language" by B. Kernighan and D. Ritchie. In addition, VAX C includes all the extensions introduced in the language since then and is integrated into the standard language environment of VAX/VMS. Consequently, C programs can also address all available operating system functions.

The runtime routines illustrate the close link between the C language and the UNIX operating system. The VAX C compiler's runtime system includes more than 150 UNIX-specific functions. The only UNIX routines missing are those which cannot reasonably be emulated under VAX/VMS.

VAX C, a general-purpose programming language, supports modern control and data structures and can also be used to perform local system tasks. It is especially recommended for programmers who have worked with UNIX and can be used profitably to produce portable applications.

VAX C is much more than an implementation of the C language on the VAX. It is fully integrated into the VAX/VMS environment, so all services, development tools and products in the VAX Information Architecture are available. And VAX C is an elegant language, which combines the characteristics of a high-level language with the features of tried and tested MACRO Assembler.

VAX C produces shareable and re-entrant code. The compiled modules can be combined with modules in all other VAX languages. VAX C encourages logical, efficient program structures thanks to appropriate language expressions. It also offers additional operators for calculating addresses and pointers.

### Features:

- Structured programming.
- Multiple data types for numeric, non-numeric and local system programming.
- Support for stream and RMS-ISAM file formats.
- Support for floating point representation in G format.
- Production of optimised code by the compiler.
- Supported by the VAX LSE language-sensitive editor.

For ease of transport



### Runtime Library

VAX C includes an extensive library of runtime routines for standardised input and output, for mathematical functions and string functions and for direct access to the VAX Common Runtime Library.

Furthermore, VAX C offers multiple help functions for porting programs from UNIX to VAX/VMS. These include emulation of numerous UNIX-specific routines.

However, the different architectures of UNIX and VAX/VMS respectively require additional conversion of C programs if hardware-dependent or UNIX-specific characteristics are used.

### Valuable Programmer Tools

The VAX Symbolic Debugger allows debugging at the level of the C language.

Programming in C can be undertaken very efficiently if the VAX LSE language-sensitive editor is used.

The VAX C compiler optimises the generated code locally and globally, so memory requirement and program runtime are minimised. This optimisation may be switched out during the test phase.

### Development Environment

A development environment, VAXset, is offered for VAX C and the other VAX programming languages; it increases productivity in software development quite substantially. VAXset removes the burden of administrative tasks from the programming team and increases productivity in the coding and test phases. Interactive on-screen working is fully supported.

VAXset includes products for the following tasks:

- Library for version management of all sources
- Language-sensitive editor and static source code analysis.
- Transparent dynamic tests.
- Administration and organisation of test procedures (e. g. simulation of interactive users).

### VAX C

Unique Product Identifier 015

#### Complementary software products:

Data dictionary	VAX CDD/PLUS
UNIX shell	VAX DEC/Shell
Development Environment	VAXset
Databases	VAX Rdb/VMS
	VAX DBMS

Disk storage capacity (in MB):	Installation	Operation
	2.0	1.5

Complementary information in SPD 25.38



# VAX COBOL

## Programming Language



COBOL is the classic amongst the commercially oriented high-level programming languages, and VAX COBOL is the powerful implementation of COBOL on the VAX computer architecture. It is based on the X3.23 ANSI COBOL 1974 standard, which is the single standard currently valid worldwide. Most of the characteristics of the forthcoming COBOL standard have also been implemented.

VAX COBOL has direct support for DML (Data Manipulation Language) for VAX DBMS, Digital's CODASYL database system.

Integration of VAX COBOL into the VAX Information Architecture and exploitation of the hardware characteristics of the VAX architecture extend the area of use of this language beyond its traditional domain.

COBOL is used as a programming language for management tasks with the accent on finance and banking. In addition to the COBOL standard, VAX COBOL also offers some of the advantages of traditional, structured programming languages such as Pascal and PL/1, which not only facilitate the development and subsequent maintenance of COBOL programs but also help reduce costs.

### Commands and Data Types

VAX COBOL supports the EVALUATE and PERFORM commands for program structuring, as well as commands for delimiting domains of validity.

EVALUATE permits selection of command groups as a function of the condition of a variable. This eliminates troublesome branching instructions and superfluous procedure names.

The PERFORM command permits clear sequencing of program sections positioned at different locations for sequential processing.

The END-PERFORM, END-READ, END-IF and END-EVALUATE commands delimit the corresponding domains and allow clear, comprehensible organisation of programs.

### Features:

- New! Support for the VAX Source Code Analyzer now included.
- An extension to the ANSI COBOL standard.
- Uses the commercial instruction set of the VAX architecture.
- Sequential, relative and indexed-sequential access to VAX RMS ISAM files.
- Support for DML data manipulation language for accessing CODASYL and relational databases (VAX DBMS and VAX Rdb/VMS).
- All functions required for report generation.
- Supported by the VAX LSE language-sensitive editor, SCA and VAXset packages

**The classic  
language of business**



Apart from the data types provided for in the ANSI COBOL standard, VAX COBOL supports packed decimal numbers and floating point numbers with single and double precision, together with the corresponding arithmetic.

DISPLAY and ACCEPT have been provided with extra functions for simple programming of screen form input and output.

At runtime, the VAX/VMS operating system supplies information on the current screen type.

#### Database Access

VAX COBOL supports sequential, relative and indexed-sequential access to VAX RMS ISAM files. Several users can access the data simultaneously, since the functions for record locking are embedded in the system.

It is possible to work very simply with the VAX DBMS CODASYL database and the VAX Rdb/VMS relational database from within VAX COBOL, across the interface with the data manipulation language.

#### Programmer Aware

From source programs, the VAX COBOL compiler can derive many different types of information such as the field layout for files and variables or cross reference lists; in this context, a distinction is made between read-only and write access.

The VAX LSE language-sensitive editor considerably speeds up program development. It provides a screen display of the link between error messages and incorrect source code and also allows parallel correction of source code in the test phase. VAX/VMS's symbolic debugger permits interactive program testing at the level of the COBOL source text.

Parts of the COBOL program are conditionally translatable. The translated modules and programs in other VAX programming languages allow reciprocal calling. The scope of supply of VAX COBOL includes a utility which converts source programs from Digital terminal format into ANSI standard format and vice versa.

#### VAX COBOL

Unique Product Identifier 099

#### Complementary software products:

Data dictionary	VAX CDD/PLUS
Development Environment	VAXset
Automatic COBOL generator	VAX COBOL GENERATOR
Databases	VAX Rdb/VMS
	VAX DBMS

Disk storage capacity (in MB):	Installation	Operation
	2.3	1.0

Complementary information in SPD 25.04



# VAX COBOL Generator

**Draw your own solutions**



**For Programming  
AND maintenance**

## Features:

- VAX COBOL GENERATOR permits automatic generation of powerful VAX COBOL programs.
- The top-down design method used by the VAX COBOL GENERATOR and its graphical interface increase the productivity of commercial programmers.
- Once descriptions of files, fields, forms and reports have been set up, they can be used jointly by many VAX COBOL programs.
- VAX COBOL GENERATOR records the complete work session. This protects against loss of development stages.
- VAX COBOL GENERATOR delivers an expandable system in which subsequent new applications can be incorporated.

VAX COBOL GENERATOR offers experienced commercial programmers the possibility of producing applications in a fourth generation development environment using a reliable, standardised language. VAX COBOL GENERATOR can produce any application which can be created by manual coding and offers in addition high-quality VAX COBOL code in a VMS Common Language Environment. Programmers can build new applications and modify existing applications within the environment of the VAX COBOL GENERATOR.

VAX COBOL GENERATOR increases programmer efficiency, by supporting fast prototype application production. The most time-consuming and critical stages – design, coding and testing – are reduced.

With its unique graphical interface, VAX COBOL GENERATOR permits the creation and adaptation of VAX COBOL programs at the level of a drawn application. The drawing is the program and is therefore always up-to-date.

VAX COBOL GENERATOR's graphical interface contains special icons which represent program elements. It allows users to draw connecting lines between these icons. The lines illustrate the logic and data flow within the program. In contrast with other COBOL generators which are no more than libraries of the COBOL modules and subroutines used most frequently by programmers, VAX COBOL GENERATOR permits generation and maintenance even at concept level. The drawing is always up-to-date because it is identical to the program.



### Development Tool for all

Using VAX COBOL GENERATOR is made easier by a large range of input/output techniques and comprehensive online help functions. Pop-up menus support beginners as they produce their first drafts, whilst experienced programmers can use command line input. As an option, VAX COBOL code can also be entered manually.

The applications programmer creates the start of the program at the highest level – a procedure which favours logical and orderly development. VAX COBOL GENERATOR supports this concept by making it possible for the user to define structural components which represent a complex function. The user can then split these components into parts. To produce VAX COBOL, it is not necessary to code all structural components for VAX COBOL GENERATOR. This permits the applications programmer to test partially completed programs.

### Simple Adaptation

VAX COBOL GENERATOR applications are simpler to adapt, because documentation can be specified on any of the parts of the application and inserted in the corresponding section of the program which is produced.

The applications programmer defines and manipulates parts of the program and relations using icons, which use components with names allocated by the user. The components are connected by lines showing the flow of data and procedures.

### Ensuring Consistency

VAX COBOL GENERATOR offers the applications programmer a data dictionary (VAX CDD/PLUS) for storage of general data definitions. This results in a single repository so data from one or more applications only needs to be modified once. The applications can then be placed in a library, incorporating the change in the data definition, and call from within different programs.

During a VAX COBOL GENERATOR sequence, a user can use the help function at any time, either by pressing the HELP key or by selecting HELP from a menu and then specifying an subject or selecting it from a list which is provided.

### The view from the top

The MAP function provides the application programmer with overall mapping of the program. Information in MAP contains component positions, component types and the status of the mode definition. The concept can be printed out using the PRINT MAP command – for security and in order to obtain a reference document. Another useful feature is the PRINT SCREEN function, enabling documentation on procedures and data flow to be obtained.

Interactive applications can be prototyped quickly with VAX COBOL GENERATOR, because it is as powerful and flexible as VAX COBOL and can generate any application which can be implemented in COBOL.

## VAX COBOL GENERATOR

Unique Product Identifier 365

### Software requirements:

Programming language VAX COBOL

### Complementary software products:

Databases	VAX DBMS, VAX Rdb/VMS
Data dictionary	VAX CDD/PLUS
Performance analysis	VAX PCA
Test organiser	VAX DEC/TEST MANAGER
Source management system	VAX DEC/CMS
Applications generation	VAX DEC/MMS

Disk storage capacity (in MB):	Installation	Operation
	2.0	2.0

Complementary information in SPD 27.16.



# VAX DSM

## Digital Standard MUMPS



Setting standards

### Features:

- Implementation of American National Standard MUMPS for VAX systems, complying with ANSI X11.1-1984.
- Multi-user database with interactive access and a powerful language.
- Functions for integration of modules written in VAX programming languages.
- Its own symbolic debugger for developing VAX DSM applications.
- Fast, reliable data access, even to large volumes of data and distributed databases.

VAX DSM (Digital Standard MUMPS) is the version of the MUMPS programming language developed by DEC. This programming language complies with the ANSI standard and is installed under the control of the VAX/VMS operating system. VAX DSM is designed as an interactive multi-user data management system. At the same time, VAX DSM is also a high-level, interactive programming language. VAX DSM can be installed on all VAX family systems. In addition, it can be used in any VAXcluster or local VAXcluster configurations.

### History

MUMPS is the abbreviation of Massachusetts General Hospital's Utility Multi-Programming System. MUMPS was originally developed as a high-level interpretative language for database software and for implementing clinical information systems. Then, in 1977, MUMPS was elevated to the standard by the American National Standards Institute as a fifth computer language. VAX DSM, the version developed by DEC, exhibits a whole series of extra features in comparison with MUMPS.

VAX DSM is specially designed for performing interactive tasks on large databases.

### Use of DSM

VAX DSM is traditionally used in the development of various clinical and medical database applications: monitoring patient files and creating doctor's reports, scheduling and invoicing. At present, VAX DSM can be found in widely varying applications such as financial accounting, commerce and industry. For some time now, VAX DSM has also met the requirements of the FIPS standard (Federal Information Processing Standard). VAX DSM has since come into use in public administration in the USA.



### Increased Productivity

As an integrated programming language, VAX DSM ensures high productivity in program development. The interpretative language makes time-consuming program development tasks such as compiling, assembling and linking superfluous. Because of the easy-to-understand commands, the programmer can use VAX DSM productively for his development and test tasks within a very short time.

VAX DSM works as an interpreter. The high speed of applications developed on the basis of VAX DSM are attributable above all to the high-powered commands. Where many programming languages frequently use several lines, VAX DSM often requires no more than a single line. In addition, VAX DSM applications can generally handle large volumes of data. They are also transaction-intensive. Here, VAX DSM optimises execution by means of a precompiler and provides an efficient environment for database management.

### Supported Configurations

VAX DSM supports any VAX configuration and is also compatible with any version of VMS. A VAX DSM application can therefore be used on a VAX system at the same time as other applications.

Because of its VMS compatibility, the user can also use VAX DSM in a VAXcluster configuration. The powerful VSM-DSM DDP (Distributed Data Processing) protocol designed for Ethernet provides the user with an efficient method of access. He therefore has distributed access to all VAX DSM databases on the cluster. To these benefits must be added the special advantages of VAXcluster configurations. These include common access to VMS files in the cluster, storage of shadow files and automatic recovery of database integrity in the event of a disk controller fault.

### Comprehensive communications

VAX DSM supports DDP, the special data access protocol for DSM databases. Thanks to the network functions offered by DEC, DDP can also be utilised as an efficient tool for communication between VAX DSM and DSM-11 systems. With DDP, the user of a specific system can easily use the data stored on another computer. Ethernet guarantees smooth data interchange between VAX computers on which VAX DSM is in use and PDP 11 computers with DSM 11. DECnet in turn offers flexible communications facilities between different VAX computers running VAX DSM. Thanks to VMS compatibility, VAX DSM also allows the user access to the communications systems supported by VAX/VMS at any time.

A driver for DSM 11 BISYNC communication allows IBM compatible binary synchronous data interchange. BISYNC's protocol emulation covers in particular the requirements for DSM applications envisaged for integration in mainframe environments. In addition, BISYNC protocol emulation permits data exchange with systems which support binary synchronous communication.

The storage and access facilities of VAX DSM offer the user maximum flexibility. At any time, DSM applications can access applications which use data records from VAX Information Architecture (VIA) products. Moreover, users of VAX DSM applications can access data managed in VIA products via a DSM language interface. Even with other applications such as those based on VIA, the facility for accessing DSM databases exists via DSM routines.

#### VAX DSM

#### Unique Product Identifier 130

No direct link with VAX Information Architecture products.

<b>Disk storage capacity (in MB):</b>	Installation	Operation
	7.2	6.3

Complementary information in SPD 25.08



# VAX Fortran and Fortran/ULTRIX

## Programming Languages



### Features:

- De facto industry standard FORTRAN.
- VAX FORTRAN for VAX/VMS, VAX FORTRAN/ULTRIX for ULTRIX-32.
- All operating system service functions can be called.
- Uses the extended floating point representation of the VAX Information Architecture.
- Local and global optimisation.
- Operations for string processing.

The language of research

FORTRAN is the classic high-level programming language for technical and scientific applications. FORTRAN has long grown out of its original task of mathematical formula translation. Today, the scope of FORTRAN-77 offers users a wide range of modern programming techniques. These include, for example, structured programming and integrated I/O operations, as well as string arithmetic and bit manipulation.

VAX FORTRAN supports the full scope of ANSI standard FORTRAN X3.9-1978 (also designated FORTRAN-77). VAX FORTRAN additionally takes account of the language elements of the earlier ANSI standard, X3.9-1966 (FORTRAN-66). The compiler detects typical elements of both standards. In cases of conflict, the compiler can be forced to adopt pure FORTRAN-66 behaviour during translation.

VAX FORTRAN is an integral part of the VAX Information Architecture. The compiler optimises the generated code "locally" and "globally". The performance potential of VAX computer hardware is fully exploited. Even today, FORTRAN is one of the most frequently used programming languages for technical and scientific applications. Areas of use extend from applied mathematics to programming real-time systems for process control. In addition, FORTRAN is also used in commercial data processing. The language also plays a significant role in schools and training.

### Extensions to the standard

In comparison with the ANSI standard, VAX FORTRAN has been extended by a whole series of highly developed functions, including:

- Data declarations:  
STRUCTURE...END STRUCTURE,  
RECORD
- Data types: LOGICAL\*1, BYTE,  
LOGICAL\*2, INTEGER\*2,  
COMPLEX\*16, DOUBLE  
COMPLEX, REAL\*16.



- Instructions: INCLUDE (access to module sections from source libraries), DO...WHILE...ENDDO (structuring), ENCODE...DECODE, ACCEPT...TYPE, DEFINE FILE (input and output).

Other VAX FORTRAN functions which exceed the ANSI standard are bit manipulation, hexadecimal and octal constants, plus the possibility of designating variables up to 31 characters in length. Supplementary test instructions can be programmed for the source program; after a successful test, these are erased automatically during translation by the compiler.

The VAX FORTRAN compiler can indicate all deviations from the ANSI FORTRAN-77 standard, including the extensions, in the program printout.

For special tasks with stringent requirements in terms of precision, VAX FORTRAN offers extended floating point representation in G format (precision up to 15 decimal places, 11 bits for the exponent, 53 bits for the mantissa) and in H format (precision up to 33 decimal places, 15 bits for the exponent, 113 bits for the mantissa).

VAX FORTRAN programs can also call modules written in other VAX programming languages. They can also access all system services.

The compiler generates modules which can in turn be addressed by programs in other languages. The generated modules can be used, in the form of a single copy, by several programs simultaneously. This means that the modules are "shareable".

The VAX FORTRAN compiler possesses a multi-phase optimiser which performs optimisation across the entire program unit.

#### Development Environment

A development environment, VAXset, is offered for VAX FORTRAN and the other VAX programming languages; it increases productivity in software development quite substantially. VAXset removes the burden of administrative tasks from the

programming team and increases productivity in the coding and test phases. Interactive on-screen working is fully supported.

VAXset offers the following functions:

- Library for version management of all sources
- Language-sensitive editor and static source code analysis.
- Automatic re-compilation of applications.
- Transparent dynamic tests.
- Administration and organisation of test procedures (e. g. simulation of interactive users).

#### VAX FORTRAN under VAX/VMS

With use of the VAX LSE language-sensitive editor and the VAX SCA source code analyser, the FORTRAN programmer has powerful tools for generating program code. This means that considerable increases in productivity are achieved in program

development. The time taken from program creation to syntactic and logical debugging is substantially reduced.

#### VAX FORTRAN/ULTRIX under ULTRIX-32

VAX FORTRAN/ULTRIX supports all the procedures and library functions under ULTRIX-32, as well as procedures which are written in other ULTRIX-32 languages such as C, Pascal and FORTRAN-77. The compiler generates symbol tables for the ULTRIX debugger, dbx.

Programs which are written in VAX FORTRAN can also be translated by VAX FORTRAN/ULTRIX, but there are certain restrictions. There are differences between VMS and ULTRIX in file structures and name declarations. The input/output functions of VAX FORTRAN/ULTRIX constitute a subset of the services offered by VAX FORTRAN under VMS.

VAX FORTRAN  
VAX FORTRAN/ULTRIX

Unique Product Identifier 100  
Unique Product Identifier A99

FORTRAN is offered in the form of VAX FORTRAN for VAX/VMS, and as VAX FORTRAN/ULTRIX for ULTRIX-32. The performance, translation speed and runtime behaviour of both products are identical.

#### Complementary software products:

Data dictionary	VAX CDD/PLUS
Development Environment	VAXset
Databases	VAX Rdb/VMS
	VAX DBMS

Disk storage capacity (in MB):	Installation	Operation
	3.3	1.7

Complementary information in SPD 25.16 for VAX FORTRAN and SPD 27.23 for VAX FORTRAN/ULTRIX.



# VAX LISP and LISP/ULTRIX

## AI Language



VAX LISP is the implementation of the Common LISP programming language running under Digital Equipment's VMS and ULTRIX-32 operating systems. VAX LISP offers the user a fully interactive working environment.

### Origin

LISP can look back on a long tradition extending over many years. As early as the 'fifties, the American John McCarthy of the Massachusetts Institute of Technology (M.I.T.) laid the foundations for this innovative programming language. The Common LISP language was then created on the basis of these general LISP language definitions. It is the result of work by AI experts who were looking for a suitable programming language for their research and development projects in the domain of artificial intelligence. One important aim was to achieve standardisation of the language. Ensuring full compatibility with existing LISP applications which had been written in dialects such as MACLISP was of equal importance. In the course of time, Common LISP finally developed into the de facto standard of the LISP programming language for many different applications in the industrial sphere.

VAX LISP is a programming language for software development and for artificial intelligence applications in which the symbolic processing of data and relationships is as important as numerical calculations. VAX LISP offers particularly simple facilities for programming of routines.

LISP is distinguished from the majority of high-level programming languages by the fact that its main focus is not to perform numerical operations.

### Features:

- Common LISP, with extensions.
- Interactive interpreter and compiler.
- Integration in VAX/VMS.
- User-definable data types.
- Input and output via an interface which is relatively independent of the implementation.
- Generation of identical program code by the interpreter and the compiler.
- LISP-sensitive editor and debuggers for LISP programs.

**The machine learns to think**



### Thinking Patterns

VAX LISP was designed from the start for processing symbolic data. Language constructs and expressions are created from the listing of individual symbols (e. g. words). The possibility of processing symbols together with the capability of representing knowledge are pre-requisites for the successful representation of human thinking patterns and associations. This requirement above all was taken into account in the development of LISP. Today, as a result of this language concept, the VAX LISP programming language is a software tool which is particularly suitable for simulating human behaviour and ways of thinking. In addition, VAX LISP is also being used as a general-purpose language for problem-solving in a wide range of applications areas.

### Compiler, Interpreter, Debugger

The VAX LISP compiler and the VAX LISP interpreter produce identical code.

The language-sensitive editor which is present in VAX LISP supports windowing. This editor is also written in LISP. Its functions can be extended simply at any time, as required.

Programs can be executed line by line, using the special debugger in VAX LISP. Furthermore, the debugger makes it possible to obtain many different types of status information.

The trace function, which is available as an extra, indicates all function calls and returns during program execution.

VAX LISP generates shareable and re-entrant code.

In comparison with Common LISP, VAX LISP offers a wide range of extended functions.

- Integrated compiler.
- Special editing functions for LISP programming, such as emphasizing pairs of brackets which belong together, automatic indenting of program lines and flexible printer control.

- Efficient memory management (garbage collection).
- Functions for defining and processing externally defined data structures.
- User-controllable error recovery.
- Dynamic program linking.

With VAX LISP, the compiled and interpreted codes can be run at any time; even parts of programs can be executed, insofar as the called procedures or data structures have already been defined.

Recompilation and linking of individual source modules is essential with all updated releases of the VAX LISP programming language. It must be ensured that common use of components of the old and new versions is not possible.

### VAX LISP under VMS

VAX LISP programs can call modules in other VAX languages. They can access RMS, the file organisation system running under VAX/VMS, VAX DATATRIEVE, VAX DBMS and VAX Rdb/VMS. There is also a facility for accessing VMS utilities and all system services.

### VAX LISP/ULTRIX

VAX LISP/ULTRIX source programs can also run under VAX LISP for the VMS operating system. There are, however, some restrictions. There are differences between VMS and ULTRIX in file structures and file naming conventions. Both products offer internal support for 8-bit characters, but only VAX LISP under VMS allows them to be input or output. ULTRIX restricts input and output to 7-bit characters.

VAX LISP  
VAX LISP/ULTRIX

Unique Product Identifier 917  
Unique Product Identifier 418

#### Software requirements:

VAX LISP runs under VAX/VMS  
VAX LISP/ULTRIX runs under ULTRIX-32

**Complementary software products:** For VAX LISP under VMS  
Source management system VAX DEC/CMS

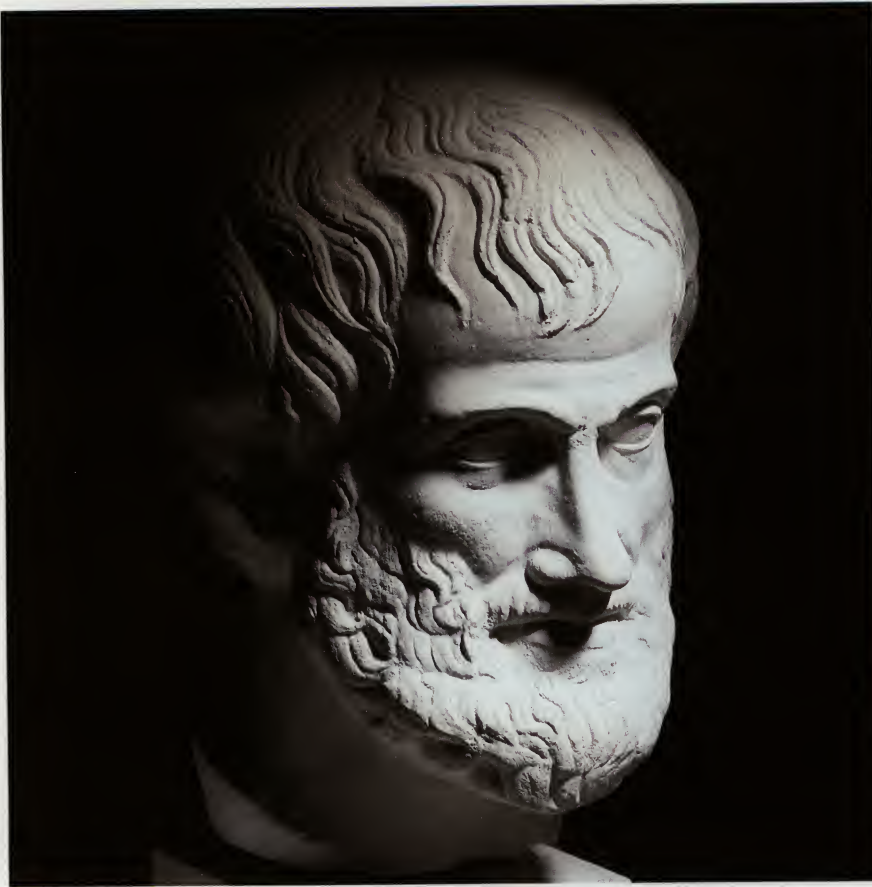
Disk storage capacity (in MB):	Installation	Operation
VAX LISP under VMS	16.0	15.1
VAX LISP/ULTRIX	≈ 5.2	≈ 5.0

Complementary information in SPD 25.82 for VAX LISP and SPD 27.05 for VAX LISP/ULTRIX



# VAX OPS-5

## AI Language



VAX OPS5 is a powerful version of the programming language OPS5. It is primarily suitable for use in expert systems and for knowledge engineering in an artificial intelligence environment. In addition, VAX OPS5 also supports the solution of complex problems in a commercial environment.

Its compiler was written in the code-optimising BLISS-32 language. The user therefore gets compact code which is more powerful and faster than OPS5 implementations written in LISP.

VAX OPS5 is an AI language which works with symbols. It is able to generate a large number of possible solutions and process several solutions respectively for several problems. Such an AI tool is an appropriate computer-assisted solution when the envisaged application has little in common with conventional algorithmic solutions or when the requirement is subject to frequent changes and can be delimited only with difficulty, if at all.

VAX OPS5 is a language for developing rule systems. It permits solutions to problems based on exploitation of human knowledge and human experience and it is a suitable tool for programming a wide variety of expert systems.

### Features:

- Arrangement of rules in any sequence, to facilitate program management and reduce programming time.
- Tools for evaluating performance and determining time required for individual OPS5 program steps.
- Program calls comply with the VAX calling standard.
- Possibility of developing real-time applications using the optimising compiler.
- Online help function for the programming language.

**Computing expertise**



### Any Rule

Rule systems consist exclusively of IF-THEN instructions and they operate with two data memories, one working memory and one memory for rules. The working memory contains a model of the current status of the problem. The rule memory initiates defined actions when certain conditions occur simultaneously in the working memory. The rules consist of a condition (the IF element) and the corresponding instruction for action (the THEN element).

In conventional programming languages, the sequence of rules within the program is of great importance. Placing of a new rule incorrectly can change the whole program and lead to erroneous results.

For VAX OPS5, the sequence of rules is irrelevant. Arbitrary arrangement simplifies programming considerably.

### One of the fastest OPS-5 versions available

Applications which are written in OPS5 can call and be called by all languages and services which support the VAX calling standard. These include VAX DATATRIEVE, VAX DBMS or VAX Rdb/VMS as well as system calls to modify the working memory.

VAX OPS5 is a highly developed, optimising programming language for developing forward- and backward-chaining rule-based expert systems. It is one of the fastest versions of OPS5 and is extremely economical in its use of system resources.

#### VAX OPS5

Unique Product Identifier 913

#### Complementary software products:

Source management system

VAX DEC/CMS

Disk storage capacity (in MB):

Installation  
1.5

Operation  
0.8

Complementary information in SPD 27.04.



# VAX PASCAL

## Programming Language



### Features:

- Marking of all commands which go beyond the ISO and ANSI standards.
- Testing of limits of fields, strings and domains during runtime.
- Testing of arithmetical overflows and checking of branched jump instructions during runtime.
- Generation of information for error tracing.
- Creation of a table with cross references.
- Supported by the VAX LSE language-sensitive editor.

VAX Pascal is an extended implementation of the Pascal programming language, which was defined in 1974 by Jensen and Wirth in the "Pascal User Manual and Report". VAX Pascal is compatible with each stage of the ISO specification – both with Pascal ISO 7185-1983(E) and ANSI/IEEE 770X3.97-1983. In addition, VAX Pascal complies with the requirements of Federal Information Processing Standard Publication (FIPS-109) and has been extended beyond the standards. It produces optimised, shareable programs which use VAX floating point and string commands as well as the virtual storage architecture of the VAX.

VAX Pascal is suitable for training in schools and universities, for the development of industrial and commercial applications and also for local system programming.

VAX Pascal is fully integrated into the VMS environment. It offers all methods of accessing VAX RMS:

- sequential
- direct
- indexed-sequential.

Procedures in all other VAX languages can be called by VAX Pascal. The modules are translated separately. Various options can be specified for translation purposes; these options perform additional checks during program runtime. Amongst others, they include exceeding of subscripts in matrix processing, illegal branch marks and illegal pointers.

**From school  
to doctoral thesis**



VAX Pascal offers extensions to the Pascal standard. They include:

- DOUBLE data types (D and G format) and QUADRUPLE (H format) for the VAX extended floating-point representations.
- VARYING data type for strings of variable length, with up to 65 535 characters.
- String handling functions such as INDEX, LENGTH and SUBSTR.
- Language elements for sequential, direct and indexed-sequential access to VAX RMS files.
- Facility for linking procedures and functions with the option of compiling them separately from the main program.
- Binary, octal and hexadecimal constants.
- External procedure and function declarations.
- Position-independent parameter passing.
- Variable names with up to 31 characters.

#### Input/Output Enhancements

Pascal's I/O capability is extended by OPEN, CLOSE and FIND procedures. Within the OPEN procedure, file attributes can specify the establishment or the type of access. The FILE procedure allows direct access to sequential files with fixed-length records. Further standard I/O routines are provided in VAX Pascal.

VAX Pascal is supported by the VAX LSE language-sensitive editor. Record definitions can be stored centrally in VAX CDD/PLUS Common Data Dictionary.

#### Development Environment

A development environment, VAXset, is offered for VAX Pascal and the other VAX programming languages; it increases productivity in software development quite substantially. VAXset removes the burden of administrative tasks from the programming team and increases productivity in the coding and test phases. Interactive on-screen working is fully supported.

VAXset offers the following functions:

- Library for version management of all sources
- Language-sensitive editor and static source code analysis.
- Automatic rebuilding of applications.
- Transparent dynamic tests.
- Administration and organisation of test procedures (e. g. simulation of interactive users).

#### VAX PASCAL

Unique Product Identifier 126

#### Complementary software products:

Data dictionary	VAX CDD/PLUS
Development Environment	VAXset
Databases	VAX Rdb/VMS
	VAX DBMS

Disk storage capacity (in MB):	Installation	Operation
	2.0	1.0

Complementary information in SPD 25.11



# VAX RALLY

## Application Generator



**Speed up your  
developments**

### Features:

- Powerful fourth generation development environment with tools for creating databases, screen forms and menus.
- Integrated with VAX CDD/Plus, where all Rdb metadata and changes are stored
- Significant ease-of-use enhancements to the user interface compared to previous versions
- Access to data extended to include direct, multi-user, read and write access to RMS files without VAX Datatrieve
- "Query-by-example" tools for database access.
- RALLY runtime option now available to cost-effectively allow distribution of RALLY applications to target VAXes, without development or application editing capabilities

- Full integration into the VAX Information Architecture (VIA) and into the products of the ALL-IN-1 office information system.

The VAX RALLY development generator, which can be used with the VAX TEAMDATA information and planning system, has been specially designed as a fourth generation system for applications development. Rdb/VMS and RMS databases, as well as forms, reports and menus, can be set up cost-effectively using this generator's integrated tools. VAX RALLY is equipped with numerous help functions.

The generator's menu interface ensures simple, fast access to all standard functions. When applications are completed, they can be used directly via VAX RALLY. Suitable runtime environments for VAX RALLY applications include the VAX RALLY runtime system, VAX TEAMDATA as well as ALL-IN-1 menus.

### Database Creation and Maintenance

By means of the menu-controlled database functions of the VAX RALLY development generator, Rdb/VMS databases can be created and maintained in the same simple way as other VAX RALLY applications. In this context, too, VAX RALLY offers the user many powerful functions such as the definition, modification, deletion and commentaries on databases including relations, fields and indices.





### Forms and Reports

The form and report processor built into the VAX RALLY development generator has a key function. By using a subsystem it is possible to generate forms and reports quickly and reliably. Depending on his individual requirements, the development engineer can also employ the working steps used to develop forms in the creation of reports. It is simply a matter of the specified type of access (input only, output only, query, search/update/delete) which determines whether an object is handled as a form, a report, a query template or a report for processing.

### Record Templates

The VAX RALLY development generator includes the facility for automatic creation of forms and reports on the basis of the information contained in a database description. In addition to screen mapping and validation mechanisms for individual fields, video options (on-screen emphasis) plus complex termination routines and multiple windows may be a component of forms and reports.

### Menu Generation

With its numerous functions for menu generation, the VAX RALLY development generator meets the essential requirements for developing user-friendly menus. These include, for example, the strip menus provided as standard for simple applications, like those used in VAX TEAMDATA.

### ADL in database development

The components of the VAX RALLY development generator also include the Application Development Language (ADL). This language is designed for many different functions such as validation operations on specific fields, special computing operations and specific interactions in database development. The ADL definition language, which has similarities with the Pascal programming language in the way it works, allows simple expansion of forms, reports and menus with the addition of powerful functions such as those required for certain calculation operations and plausibility checks.

In each phase of the development process, the generator offers the user constant support in the form of suitable instructions and information. The development engineer is continuously informed by the system of suitable values for fields, functions and variables. In addition, comprehensive help information can be transferred into a complete application.

VAX RALLY	Unique Product Identifier A86
VAX RALLY Runtime	Unique Product Identifier VF4

#### Software requirements:

Database management system	Rdb/VMS
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#### Complementary software products:

Information and planning system	VAX TEAMDATA
Office information system	ALL-IN-1
Data dictionary	VAX CDD/Plus
Relational database	VAX Rdb/VMS

Complementary information in SPD 27.03



# VAX RPG-II

## Programming Language



### Features:

- Commercial, problem-oriented programming language.
- Supports the RPG II standard.
- Processing of tables and fields, support for report formatting.
- Supports migration of commercial users to VAX/VMS.
- Has its own screen-based VAX RPG II editor with key assignments designed for the language.
- VAX RPG II editor with online help text.

VAX RPG II is a version, extended for the VAX/VMS architecture, of the RPG II problem-oriented programming language developed by IBM for commercial applications. VAX RPG II permits generation of various reports and other applications for commercial data processing; it comprises a compiler and an editor.

VAX RPG II is incorporated into the VMS standard language environment. Programs in VAX RPG II can call modules in other VMS languages as well as many runtime library programs. In addition, the VMS system services and utilities can be called. VAX RPG II works with VMS Record Management Services (RMS). Thus files which have been created with VAX RPG II can be processed by many other VAX programming languages – and vice versa. The VAX Symbolic Debugger can also be used for VAX RPG II programs.

### Compiler

From the source program, The VAX RPG II compiler generates a project module which is linked to form an executable program using the VAX linker. During compilation, a source program report with error messages can also be produced; this specifies the location of errors (line and column of the error) in the source code. There is the additional possibility of producing a machine code report and an assignment list.

**Classic report generation  
on the VAX too!**



## Editor

VAX RPG II has an interactive screen editor which is tailored for development and modification of RPG programs. The editor works with two screen windows. The bottom half always displays the source code of the file which is being processed. The top section can also display the RPG source code. The top window can, however, also be used to display help information. In this context, for example, the structure of the RPG specification which is being processed or a key assignment diagram for the numeric keypad can be displayed. A ruler with column numbers shows the user the positions of the fields to be entered.

Many other computer manufacturers offer versions of RPG II for their own system architectures. Many programs which have been written on these other VAX RPG II compilers can be converted for recompilation under VAX RPG II.

## Recompilation under VAX RPG-II

Because of the differences in architecture between IBM and VMS systems, it cannot be assumed that all RPG II programs written for an IBM system environment will be able to be compiled and run without modification under VMS. In the case of programs which are made to use specific features of a given computer or manufacturer environment, tailoring will be necessary.

## Development Environment

A development environment, VAXset, is offered for VAX RPG II and the other VAX programming languages; it increases productivity in software development quite substantially. VAXset removes the burden of administrative tasks from the programming team and increases productivity in the coding and test phases. Interactive on-screen working is fully supported.

VAXset offers the following functions:

- Library for version management of all sources
- Language-sensitive editor and static source code analysis.
- Transparent dynamic tests.
- Administration and organisation of test procedures (e. g. simulation of interactive users).

## VAX RPG II

Unique Product Identifier 114

### Complementary software products:

Data dictionary  
form generator

VAX CDD/PLUS  
VAX FMS

Disk storage capacity (in MB):

Installation  
1.3

Operation  
0.6

Complementary information in SPD 26.05



# VAX SCAN

## Lexical Processing Tool



### Features:

- Block-structured language with extra language elements for processing text patterns.
- Universal parser for processing character strings.
- Allows any mix with modules of other VAX programming languages.
- Supported by the VAX LSE language-sensitive editor.

VAX SCAN is a high-level programming language for building compilers and cross-compilers. In addition to the customary character string operators, VAX SCAN offers powerful constructs for performing comparison and sort operations on complex text patterns. Because of this capability, VAX SCAN is used in particular for the development of filter, translation and analytical routines, as well as preprocessors and parsers.

VAX SCAN is a tool for analysing text and converting it into actions or other text patterns. In-house development of products for this sector becomes superfluous. Digital uses this product for its own compiler construction operations.

### Text Patterns

In addition to a block-structured language for traditional algorithmic processing, VAX SCAN includes a second language for performing text pattern operations. Text pattern operations are carried out according to a simple principle. VAX SCAN programs convert text input into text output with the aid of defined macros. Each of these macros describes a text pattern, which is searched for in the input text, and an algorithm for transforming the found pattern into the output text. Input text patterns are described in "Backus normal form", ie: the description is similar to the one used in VMS manuals.

**Decisive Construction**



VAX SCAN's algorithmic language resembles Pascal. VAX SCAN requires accurate data type assignment and supports the following data types:

- INTEGER
- BOOLEAN
- FIXED STRING
- VARYING STRING
- DYNAMIC STRING
- FILE
- OVERLAY
- POINTER
- TREE
- FILL
- TREEPTR
- RECORD
- User-defined types.

Programming of macros for text conversion is considerably facilitated by special commands. There are also extra instructions for controlling the search operations according to specified text patterns.

VAX SCAN is fully integrated into the VAX/VMS environment. This has the advantage that VAX SCAN programs can be called in all VMS languages and VAX SCAN in turn provides easy access to routines in other languages and runtime libraries, as well as system services and operating system utilities. The VAX Symbolic Debugger test aid is used for program testing. The VAX LSE language-sensitive editor facilitates program development.

#### VAX SCAN

Unique Product Identifier 495

##### Complementary software products:

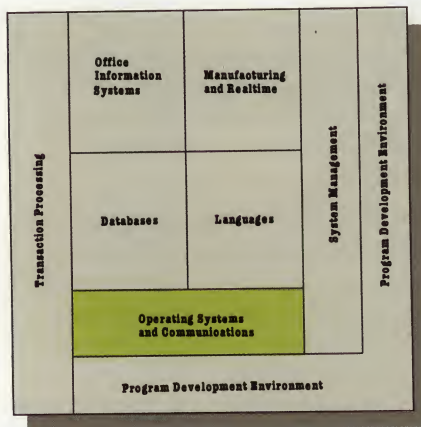
Development environment VAXset

Disk storage capacity (in MB):	Installation	Operation
VAX SCAN	0.9	0.6
VAX SCAN with LSE	16.3	2.2

Complementary information in SPD 26.93



# Operating Systems and Communications



## DECnet

DECnet is the software that forms the basis of Digital's local and wide area networking technology. It runs on the complete range of Digital machines; a version (DECnet-DOS) also runs on selected MS-DOS and PC-DOS based Personal Computers.

## DECnet System Services

DECnet System Services allow all the computer and capital equipment resources on a local area network to function as a single, large computer system. DSS products include:

- DNS – Logical Name Services over a LAN
- DFS – Allows connection to Distributed File Systems
- DQS – Allows connection to LAN Print Resources
- RSM – Remote System Manager. Allows a central group to manage, backup and install applications on otherwise standalone machines

## VMS/ULTRIX Connection

Digital's new VMS/ULTRIX Connection Software provides an NFS server environment for VAX/VMS, and also adds selected UNIX Internet Protocols. These include TCP/IP, UDP, ICMP and FTP. The VAX/VMS system manager can manage this server environment without a detailed knowledge of UNIX or ULTRIX environments.

## VAX/VMS Services for MS-DOS

VAX/VMS Services for MS-DOS allow selected IBM, Compaq, Olivetti and Digital MS-DOS Personal Computers to use the facilities on a DECnet computer network as if all resources were local. Disks, File and Print Resources, though believed to be local by the PC and it's applications, can be shared amongst a user community.

## DEC/IBM Links

Digital offer an extensive range of software products that allow the connection to various IBM hosts and services. The base communication options are listed here. See the MAILbus section in 'Office Products' for details of Electronic Mail connections for CMS, DISOSS and PROFS users. Also see the EDE/ DISOSS section in 'Office Products' if you wish to transfer final or revisable form documents between an IBM host and WPS-PLUS, ALL-IN-1 or DECwrite documents.



## Digital – leading distributed systems manufacturer

The days of centralised data processing, of “islands” of computing, are numbered. Tomorrow’s system is the network, through which powerful computer systems in the office and in production centres, technical workstations and telecommunications systems can communicate with each other.

Digital itself operates one of the largest networks in the world, with more than 25,000 active computers (as of June 1988). Twenty or so computers are added every day. They are connected up whilst the network is running and at minimal administrative cost.

The efficiency of networks naturally increases with the number of linked computers and of users who communicate with each other. The pre-requisites for this are well thought-out network functionality and a technically open network which allows systems from different manufacturers to be connected.

Such technical openness can be achieved only by the unrestricted application of international, neutral communications standards, as formulated in the OSI (Open Systems Interconnection) of the International Standards Organisation (ISO). Digital supports the OSI standards and promotes the development of products which meet the standards.

On this basis, Digital is already meeting the requirements for modern, powerful networks – with the Digital Network Architecture (DNA), which is characterised by its integration of internationally recognised standards.

Digital also offers fully developed products for integrating existing isolated PC solutions into a DECnet network. These link the PCs via Ethernet into the computer network. PC system management can then be performed centrally by a VAX PC server.

By using Digital network gateways, a local area network (LAN) can be expanded into a wide area network (WAN) which extends over several cities, countries or even worldwide. Network users then have access not only to DECnet but also, via the DECnet/SNA gateway and the corresponding software, to IBM systems as well.

From the user’s viewpoint, there is no difference between working in a local or a wide area network. With Digital communication products information can be called up from any location – the next room, a different city or another country.

The wide range of network products and services makes Digital the leading networked computer manufacturer and testifies to the company’s consistent commitment to international standards.

The Network is the System!



# DECnet

## Enterprise wide Communications



DECnet is the implementation of the Digital Network Architecture (DNA) that runs on both Digital PDP11, VAX and VAXmate hardware plus selected Personal Computers running either MS-DOS or PC-DOS.

A suitably configured network supports up to 63 areas, each of up to 1,023 host machines (termed nodes in Digital parlance). Communications may be over many different speeds and quality of media, from Ethernet to asynchronous terminal lines. This detail – and the geographic location of the machines used – is not apparent to either the user or the application.

DECnet comes in one of two different types; end-node implementations have only one network media connection. In contrast, full function DECnet allows multiple network media connections on one host, and also provides routing functions to network packets. In the event of machine or communication line failures, information is automatically rerouted if an alternative path is available. Unlike some other wide area networking technologies, the user does not have to specify alternative paths to try; DECnet reroutes dynamically, and can take immediate advantage of changes in the network configuration as new resources are added.

### Features:

- The basis of most Digital-to-Digital Communications
- Communication Media independent, peer-to-peer networking with automatic re-routing if a path is inaccessible
- Versions running under VMS, ULTRIX, RSX, RSX-11M-PLUS, TOPS-20, RSTS/E, RT11 and selected MS-DOS/PC-DOS Personal Computers
- Mail, File Transfer, Remote Resource Access, Remote Terminal sessions (SET HOST) and Program-to-Program Communications bundled in... not extras
- Extensive range of additional gateways, services and DECnet compliant applications available today
- Wide Area and Local Area Networks share identical syntax and application access... just write your software once!

**No limits**



DECnet offers similar facilities across all different operating systems, limited only by the connections available and the resources accessible on each:

### Virtual Terminal (SETHOST)

The user can set up a terminal link to a remote system just by specifying its name. The target system can be anywhere on an enterprise-wide DECnet network.

DECnet-DOS, the implementation of DECnet on selected Personal Computers, gives the PC user VT220 capabilities with an inbuilt script processing language.

### File Transfer

Files can be exchanged between any two machines on the enterprise-wide DECnet network. Passwords are normally required to achieve this.

### Electronic Mail

All implementations of DECnet come with a MAIL program, allowing you to send mail to any other machine/user on the network. In the case of single tasking operating systems such as RT11 and MS-DOS, mail receipt is not possible when another application is running. However, the user has the ability to redirect replies back to a nominated multi-user host.

### Program to Program Communication

Data can be exchanged between different programs on different computers across the network. DECnet continues to be peer-to-peer in nature, as it's been for over twelve years!

### Access to Remote Resources

Users can share peripherals, databases, file and print resources as if they were local to their applications.

Users of DECnet-DOS can also nominate the location of up to four virtual disks anywhere on a wide area network; E: in London, F: in Paris, G: in Amsterdam and H: in America. It works!

### The Future

DECnet is migrating to be compliant with OSI proposals, which will ultimately allow computers of all makes to communicate, much in the way that telephone systems work today. Until the base capabilities are

present, Digital sells a variety of products to give OSI capabilities:

- VAX OSAK – Applications Kernel and Transport
- VAX MR/X – X.400 Electronic Mail (see MAILbus)
- VAX FTAM – OSI compliant File Transfer

Digital also sell a variety of products to integrate DECnet networks with other host environments, particularly SNA and appropriate layered services.

Further details can be found in this catalogue. More detailed information about DECnet and how to configure a network can be found in the 'Networks and Communications Buyers Guide', order number ED-32596-42.

DECnet-VAX	Unique Product Identifier D04	(End Node)
	Unique Product Identifier D05	(Routing)
DECnet-ULTRIX	Unique Product Identifier 716	(End Node)
DECnet-DOS	Unique Product Identifier A05	(End Node)
DECnet-VAXmate	Unique Product Identifier 000	(End Node)

Complementary software products:	VAX/VMS Services for MS-DOS	
	DECnet/SNA 3270 Terminal Emulators	
	DEC/IBM Links	
	VAX/VTX	
	VAX NOTES	
	VIDA	
	VAXlink	
Complimentary Information:	SPD 25.03	(DECnet-VAX)
	SPD 25.83	(DECnet-ULTRIX)
	SPD 50.05	(DECnet-VAXmate)
	SPD 50.15	(DECnet-DOS)



# DECnet System Services

## Local Area System Software



### Features:

- Allows users and applications distributed over several computers to access the same data
- Cost effectively shares high capacity disk drives and printers among a community of autonomous systems
- Simplifies system management tasks associated with distributed VAX/VMS or VAX Ultrix Systems

DECnet System Services (DSS) are a range of four individual software products that allow autonomous networked VAX computers to share data, printer and system management resources. DSS configurations can grow from just a few systems to hundreds of systems without major reconfiguration or disruption of service.

Using DSS Products, computer users can concentrate on their jobs rather than on managing their individual systems.

### Choose which DSS services will be used on which systems

DSS is a set of products that are packaged and sold separately. Each system in a network can use the services it chooses without affecting the other systems.

### Choose centralised or distributed management styles for your system

Some sites may want to manage their systems hierarchically, while others may want to maintain complete autonomy for individual systems. DSS products allow both styles to co-exist within a network.

DSS products are available for all VAX systems. They are compatible with and complement other Digital communications and system software products, such as DECnet and VAXclusters.

When systems cannot be combined into clusters because of topological restrictions or the desire to maintain system autonomy, DSS can provide an effective alternative.

There are four initial DSS products:

- VAX Distributed File Service (DFS)
- VAX Distributed Queuing Service (DQS)
- Remote System Manager (RSM)
- VAX Distributed Name Service (DNS)

### VAX Distributed File Service (DFS)

Distributed File Service provides high performance file sharing between VMS systems. Users on many VMS systems can directly and efficiently access remote groups of files. Those users and their applications then have access to identical, up to the minute information. For instance, you can use DFS to store documents, program sources or executable applications.

Because only one copy of a file may be needed, the total file storage required to support a group of systems can be decreased.

DFS is completely transparent to VMS. DFS can be used to read and write files, and to perform directory operations, without users knowing that the actual file storage resides on another machine.

**The Network is the System**



When accessing files using DFS, there is no need to specify a DECnet node name. DFS uses the distributed name service (DNS) to store information about the location of physical file storage. Using DNS provides location independence; disk volumes can be moved from one machine to another, transparent to all users.

DFS offers excellent performance between systems connected by a LAN or high speed wide area network connections, and is very close to the performance of Ethernet based VAXclusters.

### VAX Distributed Queuing Service (DQS)

VAX Distributed Queuing Service enables VMS systems to access printers that are connected to other VMS systems. DQS offers an efficient way for systems to share print resources.

Users print on printers connected to other VMS systems using the same PRINT command and system service calls as they use for local printing. DQS also provides commands to display the status of print jobs, and to delete entries from the queue if deemed appropriate.

When printers are shared among systems using DQS they become network-wide resources. DQS makes adding new systems easy because it makes printing available to those systems without needing to purchase new printer hardware. It also allows you to average the cost of high-speed or specialised printers so making your capital equipment more cost effective.

Because DQS systems share printers, they require fewer of them. This not only reduces initial investment but also reduces the overall resources required to manage those printers.

### Remote System Manager (RSM)

Remote System Manager provides tools for managing a number of computer systems in a distributed environment – over local or wide area networks. It allows a site to operate with fewer computer management resources than it might otherwise

require. RSM frees users of workstations and systems from system management tasks so that they can concentrate on the job they are paid for.

RSM makes it simple to provide consistent copies of software to systems and reduces intervention by users. Software Installation now becomes a service that can be offered to users by a site facility.

RSM can perform initial system loads, or can load layered products on top of existing systems. An organisation can build 'libraries' of software configurations that are tailored to specific needs. Those libraries can be automatically loaded into systems when users ask for them.

With RSM, users can back up files with a minimum of effort. RSM maintains a schedule of backup times and instructions, and it starts the desired operations without user intervention. Such automatic backups can become a service which can be offered to a collection of systems by a site facility.

An RSM installation can support hundreds of systems through a single management interface. In order to co-ordinate the multiple server systems required to support a large site configuration, RSM stores some of its information by means of the distributed name service (DNS). This allows RSM to be configured so that its services are available even if some of the server systems are down.

All of the VAX range of processors can participate as clients, and both VMS and Ultrix systems are supported.

### VAX Distributed Name Services (DNS)

VAX Distributed Name Service provides a global naming service that stores certain types of information for DFS and RSM. DFS uses DNS to maintain information about the names, locations and groups of remote files. RSM uses DNS to store names and attributes of RSM server and client systems. Having multiple copies of such information enables the service to have higher reliability and better overall performance.

DNS call hold information about millions of entries and still provide efficient access and reliable operation. Thus DNS can support very large networks with many different applications storing information.

DNS can be configured to use multiple computer systems, each running server software, to implement a single naming service. Each server holds only a portion of all the naming information that is available. Typically, information is stored closest to where it is most frequently read and modified, but all information can be accessed from any system in the network.

Information may also be replicated on several systems, and DNS will automatically update all copies of that information to reflect any changes.

### DECnet System Services Unique Product Identifier

VEQ (DFS)  
VER (DNS)  
VEN (DQS)  
B14 – (RSM VMS Server)  
B13 – (RSM VMS Client)

### Software Requirements:

DECnet-VAX  
DNS is a prerequisite for DFS and for RSM

### Complementary Information:

DFS – SPD: 28.78  
DQS – SPD: 28.80  
DNS – SPD: 28.79  
RSM – SPD: 27.32 (VAX/VMS Server Systems)  
SPD: 27.33 (VAX/VMS Client Systems)



# VMS/ULTRIX Connection

## Integrating VMS and UNIX systems



### Basic Features that grow with your needs

Organisations often select VMS for the reliability and availability of VAXcluster systems and volume shadowing. These same enterprises often choose UNIX workstations for their productivity features. The VMS/ULTRIX Connection offers communications services between the two by creating a server environment on the VAX/VMS system for UNIX workstation users.

There are four major components of the VMS/ULTRIX Connection Product; various Internet protocols, including TCP/IP and FTP; a Network File System (NFS V2.0) server for VAX/VMS; a documented Programming Interface that enables VMS users to write applications that access the low-level protocols directly; and finally, a set of commands to enable VAX/VMS system managers to monitor and control all these facilities without a detailed knowledge of UNIX networking.

### Features:

- Offers NFS V2.0 Server Environment under VAX/VMS, allowing the sharing of files between UNIX and VMS environments
- TCP/IP communications between VMS and UNIX
- File Transfer Protocol (FTP) as an alternative to NFS
- Programmer Interface
- VAX/VMS system managers can monitor and control all facilities without a detailed knowledge of UNIX networking

**From Desktop to Datacentre**



### FTP

The File Transfer Protocol physically copies data from VMS to the UNIX workstation, or vice versa.

While many users prefer the NFS methodology, FTP is useful in environments that do not have NFS capabilities.

### NFS

The NFS Server of the connection product promotes data sharing among client UNIX systems by providing a central data storage facility for VMS and ULTRIX file systems. The ULTRIX and UNIX clients can access either VMS files or UNIX compatible files stored on the VMS server; UNIX files on an NFS server are 100 percent compatible with the ULTRIX file system and UNIX based applications. VMS users can also access UNIX-compatible files through RMS.

Digital's NFS component offers superior performance, as well as more flexible security features than most other implementations offer under VAX/VMS.

The NFS Server can be active on multiple nodes in a VAXcluster, and can, if you wish, employ VAX Volume Shadowing for maximum reliability of service.

### TCP/IP and the Programming Interface

The programmer has full access to the low level protocols, including TCP/IP, UDP, ICMP and ARP. This allows programmers to build applications to fit specific local needs.

### UNIX Systems Supported

UNIX-based systems that meet NFS V2.0 prerequisites for the VMS/ULTRIX Connection include ULTRIX-32 V2.2 or later, ULTRIX Worksystem Software V1.1 or later, and SUN Microsystems Operating System V3.5 and V4.0.

#### VMS/ULTRIX Connection

#### Unique Product Identifier VHR

Note that this product is only available with a ClusterWide licence, starting at 300 points.

#### Complementary Software:

ULTRIX Mail Connection  
(See MAILbus section)

Complementary information in SPD 25.A4



# VAX/VMS Services for MS-DOS

## Personal Computer Interconnect



VAX/VMS Services for MS-DOS integrate personal computers into a company-wide information system.

With VAX/VMS Services, MicroVAX or VAX systems can be used as servers for MS-DOS personal computers (VAXmate plus selected IBM PC, PC XT, PC AT, PS/2, Compaq and Olivetti PCs).

VAXmate Services for MS-DOS make it possible to configure a dedicated VAXmate workstation as a server for other MS-DOS personal computers. The PCs linked to the server system must use special user software (VAXmate Client Software or PC Client Software respectively).

The server system allows the personal computer access to central system resources. They can use information and services of other computers and peripherals regardless of their geographical position on the network.

The personal computers, connected by a thin-wire Ethernet link, have access, via the server, to a whole range of functions and services. These include graphical user interfaces, filing and printing services, services for running programs on the basis of MS-DOS, plus file transfer services and terminal emulators.

On the PCs connected to the server, MS-Windows constitutes an optional graphical user interface with the MS-DOS operating system and the network. MS-Windows V2.03 offers mouse-driven menus as well as dialogue fields and icons, which are used in place of the usual command structure of the MS-DOS operating system.

On the server, VAX/VMS Services provide the user with a filing system for MS-DOS files. For the user this means a considerable extension of the PC's local storage facilities. The MS-DOS files stored on the server disks can be used simultaneously or consecutively by several users.

### Features:

- Integration of MS-DOS into company-wide information systems.
- Uses VAX, MicroVAX or VAXmate systems as servers for MS-DOS personal computers.
- Shared use of applications, files and resources (disk drives, printers) via servers.
- Server based disk service which runs at the same speed as an IBM-PC/AT local hard disk
- Central system management for applications, data and resources (VAX/VMS System BACKUP maintains integrity of served PC files).
- Facilities for simple access for PCs to host system data and applications.
- Protection of investments in PC hardware and software.

**The Performance Leader**



With VAX/VMS Services, simultaneous access to open files by several users can be specified, as can the nature of the operations to be performed, such as read and/or write. Certain parts of a file can be protected from unauthorised access.

The VMS server writes MS-DOS files in sequential RMS format. They can therefore also be read or interpreted for VMS applications.

The VMS server can read all RMS files. Therefore MS-DOS applications can also read files written by VMS applications.

Central data storage on the server system offers numerous advantages. All the personal computers installed on the network can access the server's VMS files, without having to copy them or transfer them. This means that each file on the system needs to exist once only. This file is accessible via VAX/VMS Services to all PC users. Common VAX/VMS backup operations also archive PC generated files without user intervention, ensuring data integrity without the monotony or risks associated with individual backup operations performed locally.

VAX Services for MS-DOS V2.1 possesses a server based, disk service. This allows a user to place 360Kb, 1.2Mb, 10Mb, 20Mb or 32Mb disk(s) on a VAX/VMS file structure. Although the disk looks like a single file to the VMS user, PCs can access the disk service with the same speed as a local IBM-PC/AT hard disk. Facilities also exist to allow VAXmates, or PCs with a Digital DEPCA Ethernet interface, to remote boot from such a disk service. With single user Read/Write or multi-user Read-only access, these disks are ideal for holding system and application software, freeing the slower shared VMS/PC file services for application data files as needs dictate.

The printing services provided by the server allow a user working at a PC to use both local printers and printers connected to the server. PC applications using devices LPT1: through LPT3: use shared printers as if they were local, unknown to the application software in use. This helps an enterprise invest in few high quality output devices without deteriorating the level of service offered to a user community.

Optional allocation of passwords to the different system users ensures that only authorised persons can access server files and printer functions as dictated by network management staff.

VAX/VMS Services also include a special software program for terminal emulation. This allows the user to set up terminal sessions with one or more hosts. This software allows emulation of the VT220 display terminal, and possesses an inbuilt script language with which to automate commonly-used command sequences. This provides PC users with the facility for data exchange between VAX and IBM systems such as DISOSS, RJE and VIDA. The files created via the host can then be transferred to the personal computer with the help of VAX/VMS Services and made available to PC users.

**VAX/VMS services for MS-DOS**  
**VAXmate Services for MS-DOS**

**Unique Product Identifier A93**  
**Unique Product Identifier A9A**

#### **Hardware Requirements:**

**Ethernet Cards:** Digital DEPCA (includes DECnet/PCSA PC Client Licence)  
3Com 3C501 for -AT bus PCs (needs PC Client Licence)  
Micom NI5010 for -AT bus PCs (needs PC Client Licence)  
3Com 3C523/MC for PS/2-50,60,80 (needs PC Client Licence)

#### **Software requirements:**

<b>Communication</b>	DECnet-VAX (includes VAX Services for MS-DOS Server Licence)	
	DECnet/PCSA	
	PC Client	Unique Product Identifier 0TL
	DECnet/PCSA	
	VAXmate Client	Unique Product Identifier 0N7

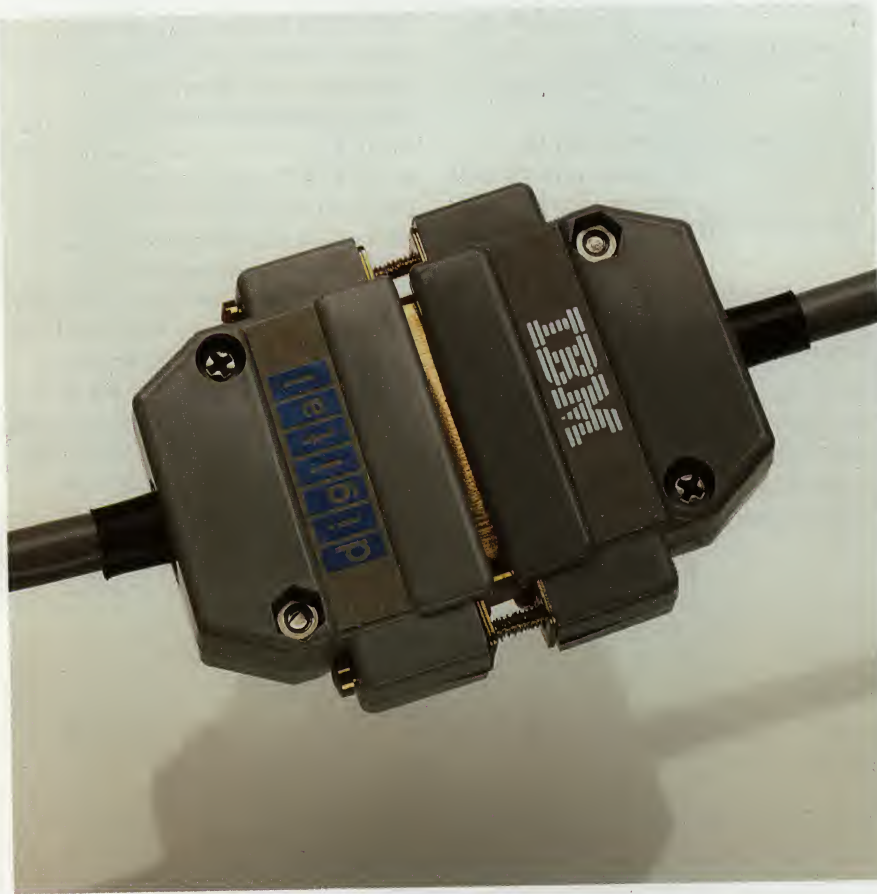
#### **Complementary software products:**

Spreadsheet Format conversion	VAX Xway
IBM Terminal Emulator	DECnet/SNA MS-DOS 3270TE
Complementary information in SPD 30.60	



# DEC/IBM Links

## Enterprise-Wide sharing of information



### Features:

- Gateways facilitate communication between Digital DECnet and IBM SNA computer networks
- VMS/SNA gives a standalone connection to an SNA network
- Gateways can be shared across a complete, enterprise wide DECnet computer network
- Many products to connect between Digital and IBM environments, where users need only be aware of their native surroundings
- Mail and Document Interchange capabilities listed in the 'Office' section of this catalogue

Digital offers a variety of products to communicate to IBM SNA network environments. Detailed descriptions of the products, plus configuration information, can be found in the 'Networks and Communications Buyers Guide', order number ED-32596-42.

### VMS/SNA

Direct connection of MicroVAX systems with the operating system to IBM SNA. If VAX/SNA and corresponding DECnet/SNA access routines are used, IBM applications can be accessed and the system can be used as a 3270 display station. In addition, documents can be exchanged with IBM DISOSS Host and distributed applications can be set up on MicroVAX and IBM systems.

Complementary information in SPD 27.01

### DECnet/SNA Gateways

DECnet/SNA Gateway establishes the link between Digital and IBM networks.

DECnet nodes with the VMS operating system can access resources, programs and information in an SNA network via SNA Gateway.

In the reverse direction, DECnet/SNA Gateway allows all users of 3270 terminal emulation on an SNA network to access resources and DECnet systems in a DNA environment. The dedicated DECnet/SNA Gateway computer requires no additional processor performance on the network and provides all Ethernet applications and access to the SNA environment.

DECnet/SNA Gateway requires the additional installation of the appropriate DECnet/SNA interfaces for programming and access routines.

To IBM computers, the gateway looks like the end node of an SNA network; to VAX computers it looks like the connection node of a DECnet network. The gateway links both computing worlds—a user at a Digital terminal can access programs and data on IBM just as easily as a user at an IBM terminal can access a VAX system.

This reverse gateway function also forms the basis for document interchange between DISOSS and ALL-IN-1.

**Digital makes it easier**



# DECnet/SNA Gateway – the bridge between computer worlds

## **DECnet/SNA Gateway-ST**

A Special combination of hardware and software for communication between DECnet and IBM/SNA networks using a Synchronous connection. The product forms the basis for all additional gateway functions.

Complementary information in SPD 25.C6

## **DECnet/SNA Gateway-CT**

A Special combination of hardware and software for communication between DECnet and IBM/SNA networks using a Channel connection. The product forms the basis for all additional gateway functions.

Complementary information in SPD 29.76

## **DECnet/SNA VMS Gateway Management Access Routines**

Any required distribution of gateway routines in one network.

Complementary information in SPD 29.70

## **DECnet/SNA VMS Remote Job Entry**

Batch processing on IBM installations with a link between IBM and VAX systems.

Complementary information in SPD 26.85

## **DECnet/SNA VMS 3270 Terminal Emulator**

Interactive access to IBM applications via VT Series terminals or compatible models. Available on VMS, ULTRIX and MS-DOS environments, running on top of their respective native DECnet implementations.

Complementary information in SPD 26.84 (VMS), 29.88 (ULTRIX) and 30.63 (MS-DOS).

## **DECnet/SNA VMS Application Programming Interface**

General mechanisms for program-controlled access to IBM applications such as CICS/VS from VAX/VMS or MicroVAX.

Complementary information in SPD 26.86

## **DECnet/SNA VMS 3270 Data Stream Programming Interface**

A collection of subroutines for communication between VAX/VMS and IBM applications, using the Logical Unit, Type 2 interface.

Complementary information in SPD 26.87

## **DECnet/SNA VMS APPC/LU6.2 Programming Interface**

APPC (Advanced Program-to-Program Communication) is a collection of subroutines under VAX/VMS for emulating the interface of a Logical Unit 6.2.

Complementary information in SPD 26.88

## **DECnet/SNA EDE with IBM DISOSS**

DISOSS Document Exchange Facility for linking a DECnet network to an IBM Office System network with access to DISOSS document library, transmission and reception of documents on the full DECnet/SNA network and within the DECnet network.

Complementary information in SPD 26.72

## **DECnet/SNA VMS Distributed Host Command Facility**

Access via IBM-controlled 327x display stations to VAX/VMS systems on the DECnet network with Host Command Facility (HCF).

Complementary information in SPD 26.71

## **DECnet/SNA VMS Printer Emulator**

Reception of printable documents from IBM applications. Emulation of an IBM 3287 printer via an IBM 3274 Cluster Controller on SNA. Output or storage of data under VAX/VMS.

Complementary information in SPD 26.70

## **VAX 2780/3780 Protocol Emulator**

Protocol emulator for VAX system and 2780/3780 with ASCII/EBCDIC translation and BSC transparency. Does not require any special gateway facility – runs over a synchronous link only.

Complementary information in SPD 25.07

## **VAX 3271 Protocol Emulator**

VT100 terminals with AVO (Advanced Video Option) and terminals with VT100 terminal emulation mode simulate 3270 keyboards when linked to VAX/VMS systems. Does not require any special gateway facility – runs over a synchronous link only.

Complementary information in SPD 25.21

## **DECnet/SNA Data Transfer Facility (DTF)**

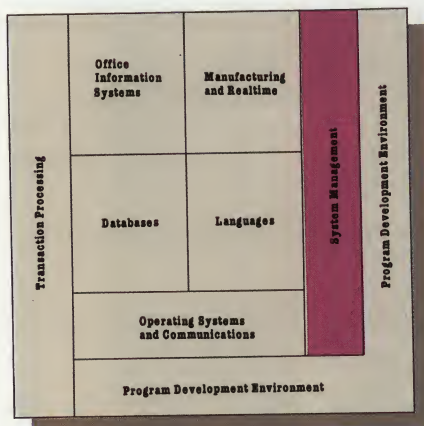
DTF allows VAX users with a DECnet/SNA or VMS/SNA connection to transfer files in either direction in conjunction with an IBM MVS/SP or MVS/XA host. Transfers can be initiated from both the IBM and the Digital environment, and includes access to both disk resident and tape resident sequential QSAM and BSAM files. These files are transferred to/from VAX RMS sequential files.

DTF allows for checkpoint and recovery, so that failed transfers can be resumed from the point of failure. The VMS user may directly manipulate files with standard VMS file utilities. The IBM user can interface to the product through an ISPF panel, a TSO command line or a command in a JES batch job.

DTF operates with Digital provided code (DTF/MVS) that runs on the IBM host.



# System Management



## VAX Performance Advisor

VAX Performance Advisor analyses the performance of individual central processing units or entire VAXcluster systems and recommends solutions in the event of bottlenecks. Performance data is gathered continuously and can be analysed on demand.

## VAX Software Performance Monitor

Software for recording system-wide and process-related performance data. VAX Software Performance Monitor produces data for capacity planning, indicates the frequency of program loops and checkpoints passed and analyses mass storage utilisation and CPU loading.

## VAXcluster Console System

Performance of full system management for a VAXcluster via a MicroVAX computer linked to Ethernet.

## VAX ETHERnim

Monitor for supervising and maintaining an Ethernet network under DECnet. Increases the availability and reliability of the network as a whole.

## LAN Traffic Monitor

Monitors Ethernet usage in conjunction with an otherwise unused LAN Bridge 100. It collects data on any protocol type used on Ethernet.

## NMCC/DECnet Monitor

Comprehensive monitoring of networked systems, lines, circuits and wires. Displays colour graphic representation of configuration and performance conditions.

## Remote Bridge Management Software

Control and monitoring of the LAN (local area network) bridge in an extended network (interconnection of many LANs which logically constitute one LAN). A LAN bridge allows connection of a considerably larger number of nodes as well as covering greater distances.



## Performance analysis and system control

DEC offers two groups of system monitors: instruments for performance analysis and instruments for controlling computer systems and networks.

The instruments for performance analysis support computer optimisation and assist with the design of system extensions. As a result of a precise analysis of system behaviour, bottlenecks can frequently be located and eliminated. The benefits of planned systems or network extensions are directly apparent. DEC offers special services for the performance analysis products.

In addition to evaluation of general system behaviour, there are naturally also facilities for examining the dynamic behaviour of applications. VAX PCA (Performance and Coverage Analyser) is used for such checks. VAX PCA is a component of the development environment and is described in this context.

The instruments for controlling distributed systems concentrate the essential management tasks on specific terminals or computers. DEC's network architecture forms the basis for concentration of management tasks in distributed systems. Thus for a VAXcluster one central console can be installed to operate all connected computers. This is a combined hardware/software solution, comprising a MicroVAX II with the VAXcluster Console System software product.

MicroVAX and VAXstation systems which are linked by Ethernet can also be managed centrally by one larger system. Central data security, central installation of new versions of software and the availability of central resources for all network users clearly reduce administrative effort for the individual systems and improve system security and the system update situation.



# VAX Performance Advisor

## Your resident VAX/VMS tuning expert



- User can request reports for a maximum of 24 contiguous hours which may exceed the bounds of a calendar day.

The VAX Performance Advisor (VPA) is a performance analysis tool, designed as a layered product on VMS. VPA also contains specific functions which enable it to analyze performance across VAXcluster and Local Area VAXcluster systems as well as individual VAX processors. VPA gathers data automatically from VMS, stores it in the VPA database, and on request from the user, analyzes the data.

The results of the data analysis are provided to the user in a report which includes the identification of possible performance problems, recommendations for further action, and supporting data for use as a basis for in-depth analysis by the user or a consultant.

VPA provides two basic performance evaluation functions:

- Analysis and Reporting
- Data Collection and Storage

### Analysis and Reporting

The analysis and reporting program, VPA\$ADVISOR, is run at the user's request to analyze the data from VPA database files, and to generate a report. There are three types of reports:

### Features:

- VPA analyses system workload data and makes recommendations for improved performance.
- Support for single VAX/VMS processors, VAXclusters and processors supported in the Local Area VAXcluster environment is provided.
- Analysis of data can be performed from any VAX processor in a VAXcluster or Local Area VAXcluster system.
- VPA identifies processes which may be using inordinate amounts of system resources.
- User can request data to support recommendations made by VPA.
- Histograms of CPU utilization, Disk I/O, memory utilization and terminal I/O for each node in a VAXcluster system are available.
- User can define collection schedules for automatic collection of performance data

**Just say when**



## Analysis Report

This is a report generated by VPA\$ADVISOR which contains conclusions drawn from the performance information contained in the VPA data base.

Accompanying a conclusion may be a recommendation on what might be done to improve the performance situation within the system, under the analyzed workload conditions. At the user's option, the conditions which lead to the reported conclusions and recommendations, and the evidence to substantiate the conditions, can be presented.

The conclusions present information and recommendations on memory management and size deficiencies, I/O bottlenecks, CPU resource limitations, VMS SYSGEN and SYSUAF parameters, and individual node miscellaneous conclusions. When used on a VAXcluster system, VPA will also report on, and make recommendations on, HSC limitations, disk limitations and locking limitations.

## Performance Report

This provides metrics on a single processor VAX/VMS system, VAXcluster or Local Area VAXcluster system workload to assist the user in gauging whether performance has improved or degraded, based on changes made according to recommendations provided in the analysis report. The performance report presents both details and summaries of workload data. Specifically, the report provides:

- Resource usages by all the images which were active during the analyzed time period
- Summaries for interactive, batch and network processes
- Locking traffic summary
- SCS data summary tables
- Disk utilizations and summaries
- Summary of tape activity for individual systems as well as cluster wide
- CPU and memory usage summaries
- Summary of pool resources by node

In addition to the text oriented performance report, the user may select one or more histograms as part of the performance report. The histograms provide a chronological view of the CPU, DISK, and buffered I/O usage for each VAX/VMS system. Coloured graphs can also be requested for about 30 important system parameters.

## Dump Report

This report provides raw data from the VPA database. The user may select to dump the full database record, or may choose to dump a portion of the database record, by selecting data from the following categories:

- Metrics
- Parameters
- Processes
- Disks and Disk Caches
- Tapes
- Communications
- System configuration and SCS

## Data Collection and Storage

The data collection utility gathers and records the system data that will be processed by the advisor portion of VPA. The data collector runs as a detached process on a single VAX/VMS processor or across a VAXcluster system. VPA supports data collection and reporting for a maximum of 1024 concurrent processes.

In a VAXcluster system, VPA uses the distributed lock manager to synchronize the data collection on all nodes. All data records will then contain a time stamp that is consistent across the entire VAXcluster system. The database files have a default retention period of seven days unless otherwise specified by the user.

The data collector program collects data according to a user defined schedule maintained in a schedule file. An hour by hour schedule can be defined for each day of the week and the same schedule file is used for all nodes in a VAXcluster system. The data collector will automatically shut off when the disk on which the raw VPA data files reside has insufficient free space.

As long as the current time falls within the time range specified in the schedule file, the data collector will write data into the database. Otherwise, the data collector will hibernate until the scheduling conditions are satisfied. When used on a VAXcluster system, the system manager may view and modify the schedule information using commands typed at any VAX/VMS node in the system.

## VAXcluster Environment

This layered product is fully supported when installed on any valid and licensed VAXcluster or Local Area VAXcluster configuration including VAXcluster configurations accessing a common system disk, without restrictions.

### VAX Performance Advisor

### Unique Product Identifier VE5

#### Disk storage capacity (in MB):

Installation  
2.0

Operation  
1.7

These counts refer to the disk space required on the system disk. The sizes are approximations; actual sizes may vary depending on the user's system environment, configuration, and software options selected.

In addition, disk space is required for the collection of performance data. The required disk space for the collection of performance data varies, depending on system workload, sampling frequency and duration of collection. As a guideline, 6000 blocks (3 Megabytes) per node per day will be adequate for a 2 minute sampling frequency (the default), with a moderate workload of 40 to 70 concurrent processes during a 24 hour collection period.

Complementary information in SPD 27.71



# VAX Software Performance Monitor

## Long term performance monitoring



VAX Software Performance Monitor (SPM) is used to check the throughput of VAX and VAXcluster systems and provides all the data required to improve the performance of the available computers and applications.

The information provided by VAX SPM helps management to plan computer system expansion. Bottlenecks are detected and performance can often be improved by modifying parameters.

The necessary data is supplied by VAX SPM. For VAXcluster systems, the user can also perform data collection centrally from one workstation. This makes the performance data for all VAXcluster systems available in one file. The performance data can be prepared according to various criteria – such as the central processing unit, storage system, etc. Consequently all the data which is essential for technical management of a computer system is made available. The data relates to purely technical relationships but also enables commercial decisions to be derived from it.

### Features:

- Analysis of existing capacities.
- Improvement of system characteristics.
- Optimal adaptation of applications to the existing computer configuration.
- Analysis of memory occupancy.
- Cost/benefit analysis of the entire system.

**Better, faster, further**



### Data Collection

The most important function is the collection of all data on performance and on performance bottlenecks in the computer system. The evolution of performance data is recorded and displayed over any desired periods of time. Thus long-term trends in the area of computer resources and in system behaviour are revealed.

Analyses for optimal settings of all system parameters are produced on the basis of the data collected. Performance data relating to configuration, system parameters, CPU behaviour and statistics on peripherals are also supplied, as is information on users and current processes. The assessments may be presented in tabular or graphical form. In this way, VAX SPM makes entire configurations transparent – even in a VAXcluster.

### Program Counter Monitor

As an additional function, VAX SPM provides the integrated SYSTEM PC SAMPLER monitor. This monitor records which activities require CPU computing time. In the process, all the information which should be known on user processes, device drivers, system modules and processes is recorded and assessed.

### System Trace Utility

The system trace facility is particularly suitable for analysis of the dynamic behaviour of system software routines which are created by the user for dedicated applications.

The Image PC monitor is provided for analysis of applications. It supplies data on the distribution of performance requirements within a software application. The information is assembled and stored while the program is running and analysed according to program modules.

### Decisions for Upgrades

VAX SPM indicates how existing storage space is utilised and how memory is used. From this data, the user can reach decisions concerning the reorganisation or growth of storage space.

Finally, VAX SPM provides the user with a performance-related and cost-related analysis of his entire system. This analysis will be of assistance in long-term planning relating to expansion and optimisation of computer resources.

#### VAX Software Performance Monitor Unique Product Identifier 850

##### Complementary software products:

VAX programming languages

VAX FORTRAN

Disk storage capacity (in MB):

Installation

Operation

3.3

1.6

Complementary information in SPD 27.56



# VAXcluster Console System

## Central control of a VAXcluster



VAXcluster Console System (VCS) allows monitoring and control of the network nodes on a VAXcluster system from a central location. The software system contributes to a substantial simplification of system manager and operator tasks.

VCS allows up to sixteen VAXcluster console ports in all to be managed. These may be console ports for VAX systems or HSC controllers. Support is guaranteed for all systems. The data transferred via the console ports is stored by VCS on the same disk of the MicroVAX system on which VCS resides.

### Features:

- Supports up to 16 nodes on a VAXcluster system (also HSC controllers).
- Recording of VAXcluster System Console System (VCS) data originating from linked VAXcluster systems, with node name and time received.
- Users can link up with any operator console on the VAXcluster from a specific VCS screen.
- Diversion of all data to a screen dedicated to this purpose.
- Simultaneous forwarding of command lines to selected nodes.
- Automatic comparison of incoming data with definable strings. Output of a report if they occur.

**Everything in one place**



VCS is equipped with the following interfaces:

#### **MONITOR interface**

This interface uses a multi-window screen format. AVT100-compatible device with the advanced video option is required. The main window can display the console data coming from one or two nodes. Other windows are used in turn to output event data or are used for command entry.

The user can perform the following functions in MONITOR mode:

- Display of the current console data for one or two nodes.
- Transfer of data to one node, several nodes or all nodes on the VAXcluster system.
- Paging (forwards and backwards) through recorded console data.

#### **CONNECT interface**

This interface makes it possible to set up a link between the user screen and a VAXcluster node. The VCS screen can then be used as a directly linked screen. Input/output using paper originals may also be used, instead of the screen. The link is shut down by means of a special control character.

The characters which are transferred are first recorded. They are then available again for on-screen display. The recordings also contain control characters (cursor control sequences).

#### **RECORD interface**

The console data received from one or more nodes on the VAXcluster system can be diverted for output on a defined screen. The output data includes:

- the time at which the data was received,
- the name of the originating node, according to its record in the VCS configuration file.

The RECORD interface allows hardcopy data output. In this context, different RECORD processes can employ several output devices.

#### **VAXcluster Console System**

#### **Unique Product Identifier V01**

##### **Complementary software products:**

Communication system	DECnet-VAX (Full Function)
Query language	VAX DATATRIEVE

<b>Disk storage capacity (in MB):</b>	Installation	Operation
	1.5	51.2

Complementary information in SPD 27.46



# VAX ETHERnim

## Monitoring Ethernet Traffic



VAX ETHERnim is a software tool for maintenance and monitoring network systems based on Ethernet. With VAX ETHERnim the system manager receives up-to-date information on the state of the various network nodes integrated into the system, including ports and lines.

Some of the most important components of VAX ETHERnim include the control and monitoring element which is installed on the network manager's VAX system, together with an extra module which can be installed on the target systems to be managed. Permitted target systems are VAX/VMS or RSX 11M PLUS computers.

The optional software for installation on target systems is a component of VAX ETHERnim. It is called RENim. In this context, the term 'host system' describes the network node on which VAX ETHERnim runs, whilst the target systems are the nodes which are to be tested.

DECnet Phase IV must be fully installed on the host system (including message forwarding functions). The system manager can localise and in some cases eliminate network problems via this host system.

### Features:

- Supervision and control of an Ethernet network for all linked VAX/VMS and RSX 11M PLUS systems.
- Database with all the information required to run the network.
- Centrally stored information across all Ethernet nodes.
- Operations analysis and fault analysis on Ethernet.

Control in the Network



### Fault testing an Ethernet network

The test extends to the connections of all Ethernet nodes (with the exception of MicroVAX and VAXstation systems). The levels which are taken into account in this process are ISO Layers I and II, layer IV (with DECnet) and level VI (with RENim).

Systems with earlier DECnet phases are also tested. The same applies even for systems on which no DECnet software is running.

VAX ETHERnim tests connecting paths as far as user level on the DECnet network. The test results are recorded and can be retrieved at any time.

### Storage of all basic information relating to nodes connected to Ethernet

The information is recorded automatically or entered by the user. VAX ETHERnim users can add to and process this information at any time. If the network is extended by additional nodes, VAX ETHERnim makes a file entry with the address and other data relating to this node.

DECnet addresses and node names, as well as identification data for nodes and port functions, are collected and stored automatically.

Certain data items must be recorded and entered by the user. These include local names of the DECnet node, the type of Ethernet link and the version of DECnet. The data is completed by telephone numbers of modems, transmission speeds, responsible contacts, location of the systems on the network and other, additional descriptions.

### Dynamic network monitoring

The transmitting and receiving nodes can be determined during operation. At this stage, information on network segment loading can be provided.

The functionality of VAX ETHERnim can be increased by installing the RENim component on target systems.

The communication paths can be tested by the loopback test in a special user area, up to DNA application level. This facility is available exclusively for VAX/VMS and RSX 11M PLUS systems.

Information on DECnet nodes on Ethernet can be accessed in order to determine the network node type, including the hardware and software configuration.

In the case of VAX/VMS target systems, RENim can be used to find out additional information.

This includes the serial number and type of the CPU, the version of the microcode and operating systems, and the hardware revision level.

### VAX ETHERnim

### Unique Product Identifier 514

#### Host system:

Any VAX system with DEUNA, DELUA, DEBNT, DESVA, DEQNA (Rev. E and above); any MicroPDP-11 and PDP-11 system with RSX-11M PLUS.

MicroVAX I, VAXstation I and II are not supported.

#### Software requirements:

Communication system DECnet-VAX (full functionality, SPD 25.03).

**Main memory capacity (in MB):** min. 1

**Disk storage capacity (in MB):** Installation 2.0, Operation 2.0

Memory requirement for very large networks (in MB):

Database network	$24.0 + (3 \times \text{number of nodes}) + 100$
Database segment	$7.5 + (1 \times \text{number of segments}) + 50$
History session	$0.5 + \text{number of hours per runtime}$

#### Target systems with DECnet

#### Software requirements:

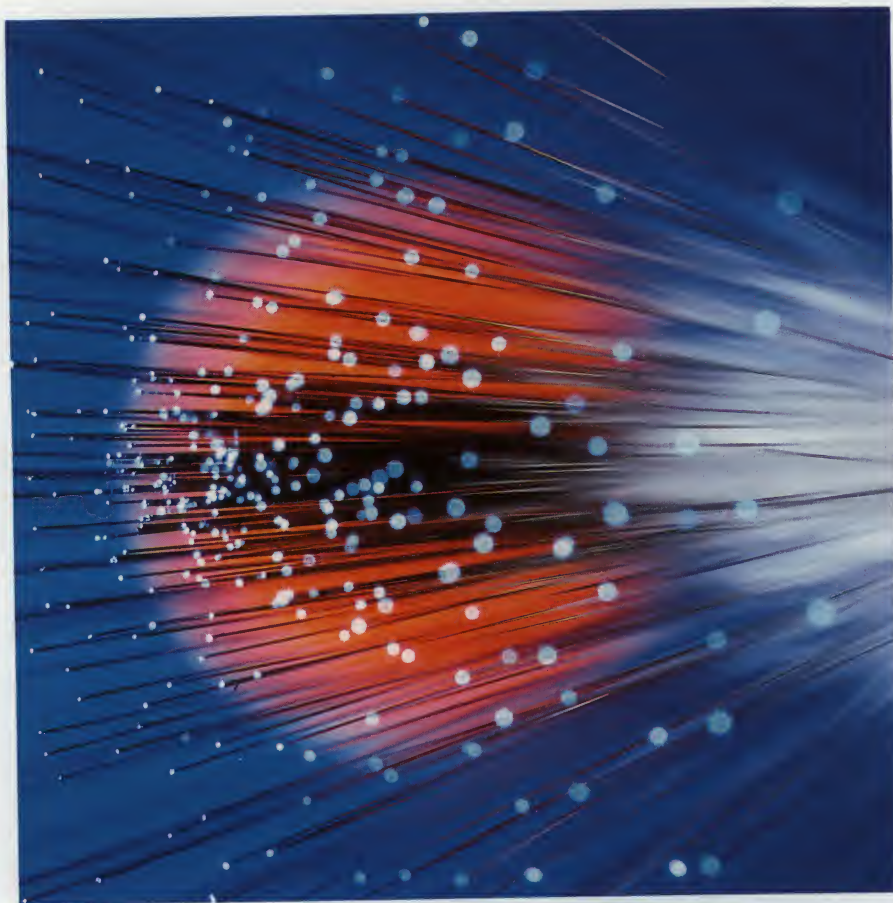
Communication system DECnet-VAX (SPD 25.03). In target systems without DECnet: Ethernet controller or software driver according to Digital/Intel/Xerox Ethernet specification, Version 2.0, with the characteristics "Respond to request ID", "Low-level loop" and "Periodic transmission of SYSID"

**Complementary information:** SPD 26.96



# LAN Traffic Monitor

## Vital Data for successful network



As organisations make greater use of Ethernet networks, the requirement for an easy way to monitor network traffic becomes ever more critical. By giving you precise measurements of your network's efficiency, Digital's LAN Traffic Monitor (LTM) helps you to identify problems caused by growing demand or changing usage. You know the exact volume of traffic in the network and it enables you to identify protocol-related problems as they occur.

You can also plan expansion more accurately to meet projected growth in usage and check up on the effects of the resulting changes. It helps you to ensure that your organisation gains maximum value from its investment in Digital's advanced networking technology.

The LAN Traffic Monitor is an Ethernet monitor that uses a Digital LAN Bridge 100 as a base from which to gather network traffic data. This data is periodically forwarded to a VAX/VMS system for compilation and analysis.

### Features:

- Accurate traffic information for an Ethernet Network
- Collects data on any protocol type used on Ethernet, for example TCP/IP, 802.3, LAT and so on
- Uses a dedicated Digital LAN Bridge 100 to gather network traffic data without performance penalty
- Extended Period Recording

**Manager aware, no surprises**



### Comprehensive Display, Easy to Use

The information is presented to the manager in a graphical format when requested, using a Digital VT340 or VT240/241 colour graphics terminal. This data may also be provided in tabular form for users of Digital VT220 or VT320 character cell terminals.

LAN Traffic Monitor has been designed to be easy to use with an integrated online help facility. This means that the new user does not need to constantly refer to the accompanying user documentation.

LAN Traffic Monitor can also report statistics to any node residing on the network provided suitable access privileges have been granted.

### Multiple Protocols, Built In Intelligence

LAN Traffic Monitor collects data on any protocol type used on Ethernet; for example, 802.3, TCP/IP, LAT and so on. From the data frames that pass along the Ethernet, the Monitor learns source addresses, multicast addresses and type fields. The information is used to classify each frame sent in terms of these categories. Each frame's type of address, single destination or multicast, is also recorded.

### Extended Period Recording

The counters that collect the statistics allow for continuous operation without wraparound for approximately 50 days, assuming a continuous rate of 1000 frames per second.

### LAN Traffic Monitor Components

The LAN Traffic Monitor comprises two components. Initially, special monitoring software is downloaded from any VAX computer on the LAN to a specified LAN Bridge 100. From that point on (until reinitialisation), the LAN Bridge 100 is dedicated to monitoring Ethernet traffic for the LAN Traffic Monitor. If the two ports of the LAN Bridge 100 are simultaneously connected to two different Ethernets, the LTM user can monitor one Ethernet or the other for the user. If the LTM LAN Bridge 100 is connected in parallel to an existing LAN Bridge 100 used to connect two segments of the same Ethernet, the user may monitor both Ethernet segments.

Note that the LAN Bridge 100 cannot be operated as an LTM listener and a bridge at the same time. However, should there be a failure of the another LAN Bridge 100 which operates in parallel to an LTM Bridge, then the LTM listener can be switched under hardware or software control to operate as the LAN Bridge 100. Thus the threat of network "downtime" is reduced.

#### LAN Traffic Monitor

#### Unique Product Identifier VEH

#### Hardware Requirements:

LAN Bridge 100, Revision E or later  
Any VAX/VMS load host residing on the same Ethernet as the LAN Traffic Listener LAN Bridge 100

#### Complementary Information in SPD: 27.80



# NMCC/DECnet Monitor

**Always in Control**



NMCC/DECnet Monitor is one of Digital's comprehensive network monitoring software products and is the basis for a complete Network Management Control Centre (NMCC). From a single VAX node, this software can monitor all the DECnet Phase III and Phase IV systems in your network; no additional hardware or software is required on the remote nodes.

NMCC/DECnet Monitor is designed to assist you in three key areas of network management:

- Network Availability and level of service
- Network Cost Control
- Network Planning

With NMCC/DECnet Monitor you can effectively monitor your network for changing traffic patterns and error conditions. NMCC/DECnet Monitor will detect degrading nodes, lines and traffic bottlenecks so you can take appropriate action before these conditions seriously impact your business. If a problem does occur, you'll be able to identify it early, thus reducing the duration of a network failure and improving network availability.

NMCC/DECnet Monitor helps you maintain an accurate on-line inventory of network equipment and communications lines. By utilising it, you can determine the appropriate amount of redundancy needed for the network—your network will not be under or over designed. Additionally, NMCC/DECnet Monitor will allow the size and effectiveness of your network staff to be optimised by providing a centralised monitoring pool.

## Features:

- Comprehensive monitoring of networked systems, lines, circuits and wires from a single host VAX
- User defined monitoring parameters
- Simple, english-like commands
- Windowing, graphic and colour displays of network configuration and performance information... which simplifies interpretation of data and highlights conditions requiring attention

**Wide Area  
Network Management**



## Network Planning

NMCC/DECnet Monitor's centralised database of network information can be the basis for your network design and redesign activities. You can create customised reports from this user accessible database, or feed this data directly into a network design tool.

By monitoring your network traffic with NMCC/DECnet Monitor, you become aware of traffic trends and can respond quickly to management questions regarding performance, usage and cost. You are also better able to predict the impact of adding new users and new applications to your network, so you can plan on orderly expansion.

NMCC/DECnet Monitor comprises three major parts: the Kernel, the User Interface and the DECnet Reports Package. Together they provide a uniquely flexible and powerful network monitoring capability. Each NMCC/DECnet Monitor module performs a valuable task in facilitating the management of your network.

## Kernel

The Kernel monitors your network and maintains the online database of network data. Once started, the Kernel runs continuously, collecting performance and operational data from the network components you select. NMCC/DECnet Monitor uses the NICE (DECnet Network Information and Control Exchange) protocol to collect data, and the Remote Event Logging Facility to receive data from networked systems selected for passive observation.

You have access to parametrical data such as status, definition counter data such as number of packets and retries, and statistical information such as averages through NMCC/DECnet Monitor. This data collected by the Kernel for network systems, wires, lines and circuits is made available to you through the user interface and the DECnet Reports Package.

## User Interface

The NMCC/DECnet Monitor User Interface provides a simple, user friendly vehicle to control the operation of the Kernel and to request on-line informational displays. These informational displays are arranged in a hierarchy of simple to use detailed data.

The displays employ colour and graphics to simplify interpretation and to highlight conditions requiring attention. For example, you can set warning and problem threshold levels for traffic and errors. In a network map, the warning situation will appear in yellow and a problem in red. You can also zoom in for more detail on a portion of a display, or you can compress a screen so that more information appears in a smaller form.

Commands are easy to learn and resemble english sentences. Some of the commonly used commands are also available via command keys, enabling the more experienced user to request the desired informational display with a few simple key strokes.

The user interface may be accessed by several persons simultaneously, and each user has the capability to build and manipulate various databases as needs dictate.

## DECnet Reports Package

The DECnet Reports Package accesses network data collected and stored in log files by the Kernel, and generates reports listing network activity. The four types of reports are: configuration, traffic, error and availability. You can also create reports for different time periods: daily, weekly or other specified lengths of time. You can get reports for your network and associated components, for selected systems in your network and its components, or for a selected system or line. You can also create customised reports from the raw data and summary information in the log files.

This variety of options gives you complete flexibility in reporting both current activity and historical data.

## NMCC/DECnet Monitor

Product Part Number QSP41

Complementary Information in SPD: 26.91



# Remote Bridge Management Software

## Monitoring and Control of an extended LAN



Remote Bridge Management Software (RBMS) makes it possible to control and monitor all LAN (local area network) bridges in an "extended local area network".

The LAN bridge hardware is the principal module of an extended LAN network, the linking of several local area networks (LANs) into a logically large network.

The LAN bridge filters data communications between the LAN segments in such a way that the only data sent to a segment is the data which is addressed to it. The LAN bridge works at data link level and is transparent to higher-level protocols.

Remote Bridge Management Software works in an extended LAN network on any selected VAX system under VAX/VMS or MicroVMS. The management functions executed by this computer system are executed in the LAN bridge firmware. The software in the VAX system and the firmware in the LAN bridge communicate with each other using the Bridge Management Protocol.

In addition, RBMS provides functions which also support the actual control and monitoring of the selected LAN bridge.

### Features:

- Control and monitoring of all LAN bridges in an extended LAN network.
- Indication of bridge status and characteristics.
- Setting of bridge parameters.
- Online help text.

Facing the world together



RBMS can output the status and characteristics of the LAN bridge. Address filter data for message forwarding to contiguous LAN nets and internal data link counters can be displayed. The bridge parameters (active/inactive, address filter and routing data) can be set directly; self-testing of the bridge can be initiated centrally by RBMS. The physical addresses of the bridge can be completed by extra information to facilitate operation and identification of the corresponding bridge. Naturally, several LAN bridges can be controlled and monitored simultaneously. If this is being done, the software excludes any collisions.

Explanatory help text can be called up at any time to support the user.

Remote Bridge Management Software consists of two modules: the Bridge Control Program (BCP, the user interface) and the Bridge Management Layer (BML).

The BCP module has multi-user capability. It is responsible for processing user commands and for communication with the BML module. The responses of the LAN bridge are converted into a readable format and outputted either on the terminal or as a file printout.

The BML module, based on the Bridge Management Protocol, is used for communication with the LAN bridges. It coordinates instructions between several LAN bridges on the one hand and several users (BCP modules) on the other.

**Remote Bridge Management Software Unique product identifier 036**

**Hardware requirement:**

Any VAX or MicroVAX system, any VAXstation

**Complementary software products:**

Monitor software LAN TRAFFIC Monitor (SPD 27.80)

**Disk storage capacity (in MB):** Installation 0.7, Operation 0.2

**Complementary information:** SPD 27.12



# Terminal Server Manager

## Central Terminal Server Control



Terminal Server Manager (TSM) allows central control and monitoring of the terminal servers operated on the network. The operator is largely relieved of the burden of configuration and control of the Digital terminal server.

TSM manages names, Ethernet addresses, server type and other characteristics on all terminal servers. Specification of the server name gives the operator access to all information in this list.

TSM permits central access to all data on each terminal server. It is an alternative to the Terminal Server Configurator (TSC) supplied for each terminal server, and has extra functions. TSM manages characteristics for the DECserver 100, DECserver 200 and MUXserver 100. TSM can amend the permanent attributes in the description file for the Ethernet terminal server directly.

### Features:

- Central control and monitoring of the terminal servers operated on the network.
- Supports DECserver 100, DECserver 200, MUXserver 100 and Ethernet terminal servers.
- Facilitates tying-in of new servers into the network.
- Periodic functional testing of terminal servers.

**An intelligent distributor**



TSM allows simultaneous control and monitoring of different servers by several operators from one or more CPUs on the network. In this context, simultaneous control of an individual server by several operators is, of course, excluded. TSM commands can be combined into command files and invoked. Support for such command files permits simple storage of characteristics for different operating modes of the server and facilitates the addition and configuration of new servers on the network. The physical replacement of servers is also supported.

TSM is especially useful for troubleshooting on a terminal server network. In addition to static tasks there are various facilities for isolating the dynamic behaviour of one terminal server.

TSM offers connection tests, which are simple and quick to carry out, for all terminal servers operating on the network and periodically checks their functional capability. These tests can be carried out regularly without user interaction and inform operating personnel only if a fault occurs.

#### Terminal Server Manager

#### Unique Product Identifier VDH

##### Hardware requirements:

Ethernet Controller from DEC, such as DEUNA, DEQNA, etc.  
MicroVAX I, VAXstation I and VAX-11/725 are not supported.

##### Software requirements:

Dependent on the installed terminal server

DECserver 100 (DSRVA) from Version 1.2 onward, Ethernet Terminal Server (DECSA) from Version 2.1, DECserver 200 (DSRVB) from Version 1.0 onward, MUXserver 100 from Version 2.0 onward

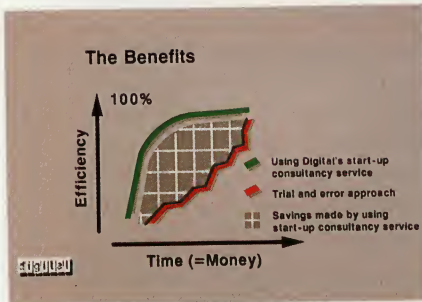
##### Disk storage capacity (in MB):

Installation	Operation
1.0	0.4

Complementary information in SPD 27.64



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# Training

The efficient use, and therefore the genuine increase in productivity accompanying the introduction of software products, can be assured only by professional training. The Digital training centres offer a wide range of courses and follow-up activities. You can obtain information about the full range of courses and seminars from our brochure, Educational Services Digest. You will also find timetables, prices and notes on the registration procedure.

## The office

The increasing significance of computers in the office is superbly catered for by Digital Equipment with the office information system ALL-IN-1. In order to be able to make use of the many facilities of ALL-IN-1 in a workplace environment, the Digital training centres offer practical courses tailored to customers' requirements.

## Databases

Databases are an important strategic area of software. The training which can be provided extends from seminars on strategic database planning and database design to special product-related courses. In this context, particular importance is attached to embedding databases and tools into the VAX Information Architecture (VIA).

## The development environment

Tools for program development and management are playing a bigger and bigger role. However, the greatest increase in productivity is achieved by implementing an integrated development environment.

## Languages

In addition to the training which can be provided in traditional technical and scientific programming languages, training is now available for the AI languages VAX LISP and VAX OPS-5, within the framework of the series of courses on "Artificial Intelligence (AI)".

The most important language courses are sub-divided into basic courses and advanced courses.

## Communications

One of the most important benefits of Digital is the outstanding networking capability of powerful computer systems. The Digital training centres reflect this fact by their wide range of topics for information and training, extending from seminars on OSI technology and standards to curricular training for DECnet networks.



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# Software Start-Up Services

*the fast path to success*



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For details contact your local sales office.

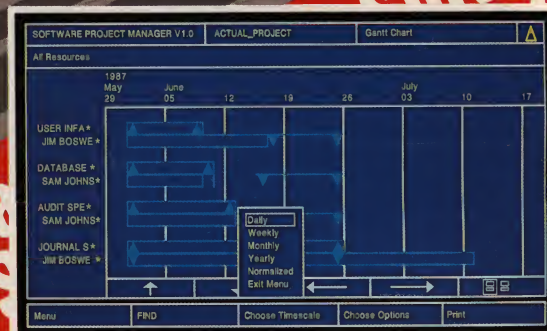
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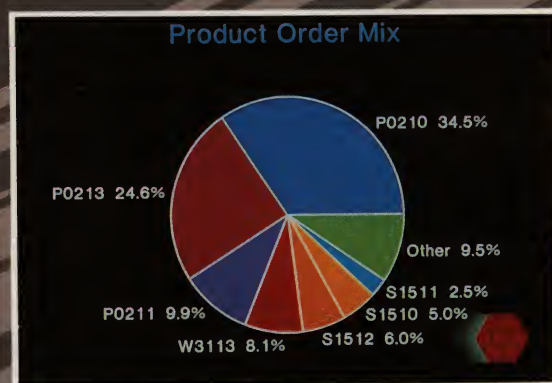
# The Network at Work

The diagram illustrates a network topology connecting three locations: Boston, MA; Washington, D.C.; and San Diego, CA. The central component is an **Ethernet** backbone. In **Boston, MA**, a box contains three components: **LSE/SCA**, **LSE/DOC**, and **NOTES**. In **Washington, D.C.**, there is a box for **8600 Conferences**. In **San Diego, CA**, there are three boxes: **8900 Documents Proj. Data**, **VAX 8800 Project Data**, and **8200 Conferences**. Arrows indicate data flow: from Boston to the Ethernet backbone, from the Ethernet backbone to Washington, D.C., and from the Ethernet backbone to San Diego. Within San Diego, there are also connections between the data boxes.



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